For Reference

NOT TO BE TAKEN FROM THIS ROOM

Ex libris
universitatis
albertaensis

QUAECUMQUE VERA

The University of Alberta
Printing Department
Edmonton, Alberta

THE UNIVERSITY OF ALBERTA

A PILOT PROJECT: THE RESOURCE REQUIREMENTS PREDICTION MODEL (RRPM-1.3) IN SECONDARY EDUCATION

by

ⓒ DOUGLAS WAYNE WESSEL

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE
OF MASTER OF EDUCATION

DEPARTMENT OF EDUCATIONAL ADMINISTRATION

EDMONTON, ALBERTA

FALL, 1973

ABSTRACT

The major concern of this thesis was to complete a pilot project involving the Resource Requirements Prediction Model in a secondary school environment. The model was designed by the National Center for Higher Education Management Systems at the Western Interstate Conference on Higher Education. The orientation of the model was toward institutions of post-secondary education. The model was subsequently validated by a number of pilot institutions in the United States.

For the purpose of this pilot project, the Grande Prairie Composite High School in the Grand Prairie City School District No. 2357 was chosen as the target institution. An evaluation of the degree to which the target institution fitted the dimensions of the model was followed by re-definition of some of the standard dimensions of the model. These revised dimensions were then evaluated by the administrative staff of the target institution.

After agreement on the definitions had been reached, sufficient data to run the instructional portion of the model were gathered from various sources about the institution. These data were then prepared and run on the model. While the model was not fully utilized in this pilot project, it was nevertheless used sufficiently to

allow for an evaluation of its compatibility with the target institution.

The evaluation consisted of individual reactions and evaluations from various members of the administrative staff of both the school and the school board central office. It was possible to appraise the model's applicability at both the school and the school-systems level. It was subsequently found that the model was more useful at the systems level than at the school level. It was also discovered that considerable effort would be required in order to acquire the necessary data to expand the model's utility in the particular environment of the target institution. However, at the systems level, it was felt that further effort would be justified in expanding the model's utility.

Digitized by the Internet Archive
in 2023 with funding from
University of Alberta Library

https://archive.org/details/Wessel1973

ACKNOWLEDGMENTS

I wish to acknowledge and thank Dr. D. M. Richards, chairman of the thesis committee, for his advice and assistance. I wish also to express my sincere thanks to Dr. J. E. Seger for his constant encouragement; and to Dr. E. W. Romaniuk for his participation on the thesis committee.

I wish to express gratitude to the staff and administration of the Grande Prairie Composite High School and to the administration of Grande Prairie School District No. 2357.

I also wish to express special thanks to my wife, Mavis, and my children, Warren, Heidi, Aaron, and Daniel, for their understanding and encouragement throughout the year. Without their support completion would have been impossible.

TABLE OF CONTENTS

Page

LIST OF TABLES x

LIST OF FIGURES xi

Chapter

I. INTRODUCTION 1

Introduction 1

Simulation and Modeling 4

The Resource Requirement Prediction Model--An Overview 9

Using RRPM-1.3 10

The Problem 12

Delimitations 13

The Importance of the Problem 14

Constraints on the Project 15

Benefits of the Project 15

Summary 15

II. METHODOLOGY 17

Introduction 17

Orientation 18

Data Collection 18

Data Analysis on RRPM-1.3 19

Evaluation on RRPM-1.3 20

Other Considerations 21

Chapter Page

Summary 22

III. DESCRIPTION OF THE DATA 23

Introduction 23

Student Data--The Induced Course Load Matrix 24

Institutional Data 30

Summary of the Data Collection 33

Description of the Institution 34

Enrollment 34

Staff workloads and salaries 34

Space assignment by department 35

Primary programs 36

Support programs 36

Summary and Discussion 37

IV. OUTPUT FROM THE MODEL 39

Introduction 39

Intermediate Output by Instructional Type 39

Student data 40

Faculty data 41

Intermediate Output by Instructional Summary 42

Intermediate Output by Faculty Rank . . . 42

Intermediate Output by Department for Non-academic Staff 42

Intermediate Output by Department (Costs) 43

Chapter Page

Summary and Discussion 43

V. EVALUATION 45

Overview of the Evaluation of the Model 45

Accurary of Representation 46

The Utility of the RRPM at the School Level 49

The Utility of the RRPM at the School System Level 51

Possible Improvements 53

Summary 54

VI. SUMMARY, IMPLICATIONS AND CONCLUSIONS 56

Summary 56

Implications 58

Conclusions 58

REFERENCES 60

APPENDIXES

A. Modifications and Definitions 62

B. Data Collection Sheets 66

C. Input Data Listing 72

D. Output of Model with Original Data 80

E. Output of Model with Revised Faculty Load Data 109

F. Interim Report on Enrolments--Grande Prairie High School 138

LIST OF TABLES

Table Page

1. Sources and Methods of Data Collection . . . 19
2. Raw Scores and Percentages by Total 25
3. Projected Enrolments from Grade Specific Figures 26
4. Crosstabulation of Grade X Level Courses by Course 27
5. Crosstabulation of Grade XI Level Courses by Course 28
6. Crosstabulation of Grade XII Level Courses by Course 29
7. Staffing Data by Department 32
8. Actual Teacher FTES versus Generated Teacher FTES 47

LIST OF FIGURES

Figure Page

1. Dimensions of RRPM-1.3 5

2. Organization of NCHEMS' Program Classification Structure 7

Chapter 1

INTRODUCTION

Introduction

Some time ago, the National Center for Higher Education Management Systems (NCHEMS) at the Western Interstate Conference on Higher Education (WICHE) initiated study on a computer based model to simulate institutions of higher education. One of the outcomes of the study was the development of the Resources Requirement Prediction Model (RRPM). Eight pilot institutions then participated in an evaluation of the model. While individual institutional evaluations differed, depending upon their perceived use of the model, some common points about the model were shared by all:

> In all cases, the implementation of RRPM-1, as with most analytical tools, provided the means for a structured analysis of the institution. . . . Thus, implementation of RRPM-1 led to a better understanding of the institution . . . (TR-19)

The experiences of the pilot institution suggested that a few problems were encountered in most tests of the model. These problems were such that most of the pilot institutions had to make revisions in the model itself and "from their experiences RRPM-1.3 (Version 3) was developed and released." (TR-20)

"The smallest computer used by the pilot institutions implementing RRPM-1.2 was an IBM 360/40 requiring 180K core memory." (TR-20) For this project an IBM 360/67 was used with a total core availability of 768K. Unlike the pilot institutions using IBM systems, the system employed in this study was under the control of the Michigan Terminal System (MTS). The basic requirement of two compilers, one for FORTRAN IV and one for COBOL-U remained unaltered.

As a further note on the evolution of RRPM to date, it was an outgrowth of the Cost Estimation Model (CEM), also developed by WICHE. It is forseen that WICHE will be continuing to develop computer simulation models. A unique feature of the WICHE simulation models to date has been the compatability of the data base structures throughout the evolutionary process. Thus, an institution is allowed to utilize new simulation models without their existing data bases becoming entirely redundant. For example: the data required to generate and run CEM are usable as part of the data required to generate and run RRPM. It is therefore logical to assume that the data requirements for RRPM will not become redundant with the advent of any further simulation models initiated by WICHE.

The above suggests a long range utility of RRPM as a management tool. In terms of the more immediate utility of the RRPM 1.3, while all of the pilot institutions found

it useful, it is interesting to note that many different uses have been made of the model. Some institutions used the model as a basis or organizing information to aid in decision-making. Some institutions used the model as an aid in resource allocation in the preparation of the budget for those institutions. Still other institutions have used the model as a means of examining the future implications of present or past decisions. The outcome of these varied applications has been a wide disagreement as to the way in which the model should be used.

Although initially designed for institutions of post-secondary education, it is forseeable that the RRPM-1.3 could be of use in institutions of secondary education. The utility of the model for institutions of secondary education can best be tested through a pilot project or study. For the purpose of this study, the Composite High School of Grande Prairie was selected as the pilot institution.

The pilot institution of Grande Prairie has many of the organizational characteristics of the pilot institutions used by WICHE. For example, the high school programs of Matriculation, General, Business Education, and Technical/Vocational Education correspond to the categoric breakdowns defined in the WICHE pilot studies as Majors. The student population of this study was similar in size to some of the WICHE pilot study institutions.

The above mentioned Major Categories is one of the nine basic dimensions involved with the RRPM-1.3. The others are: Student Levels, Course Levels, Instructional Types, Staff Rank, Faculty Rank, Space Type, Campus Activities--Primary Programs, and Campus Activities--Support Programs. Figure 1 provides a more detailed listing of the categories associated with all these dimensions except the two types of Campus Activities, which are covered in Figure 2. For the purpose of this study it was not necessary to utilize all of the categories possible within each of the dimensions, nor was it necessary to utilize the dimension of Campus Activities--Support Programs.

Simulation and Modeling

Beginning in the middle 1960's, various institutions and agencies of higher education developed and used a variety of analytical planning models, including RRPM. There are basically three types of analytical models: (1) models that describe the physical processes of an institution, (2) models which explain choices or performance on the basis of some theory of causality, and (3) models which optimize or prescribe better decisions. RRPM is a descriptive, physical process type of model.

Descriptive, analytical models are basically for the purpose of projecting the future, given the current state and the planned future decisions. Such models may be further

Major (or Fields of Study)

Any 90 majors or degrees to be defined externally.

Disciplines

Any 30 or 90 disciplines (two options allowed) at user's request. The disciplines can be aggregated into divisions, and divisions into colleges at the will of the user defined externally.

Student Levels

For example:

1. Freshman
2. Sophomore
3. Junior
4. Senior & 5th Year Undergraduate
5. Graduate I (Master & First Professional Degree)
6. Graduate II (Doctoral Students)
7. Special Students

Course Levels

1. Lower Division (Preparatory)
2. Upper Division
3. Upper Division/Graduate
4. Graduate

Staff & Faculty Rank

Faculty

1. Professor
2. Associate Professor
3. Assistant Professor
4. Instructor/Lecturer/Research Associate
5. Graduate Assistants

Figure 1

Dimensions of RRPM-1.3

Source: TR-20, Figure 4.2.

Nonacademic

1. Professional/Management
2. Technical/Craft
3. Clerical/Secretarial
4. Unskilled/Semi-Skilled

Instruction Types

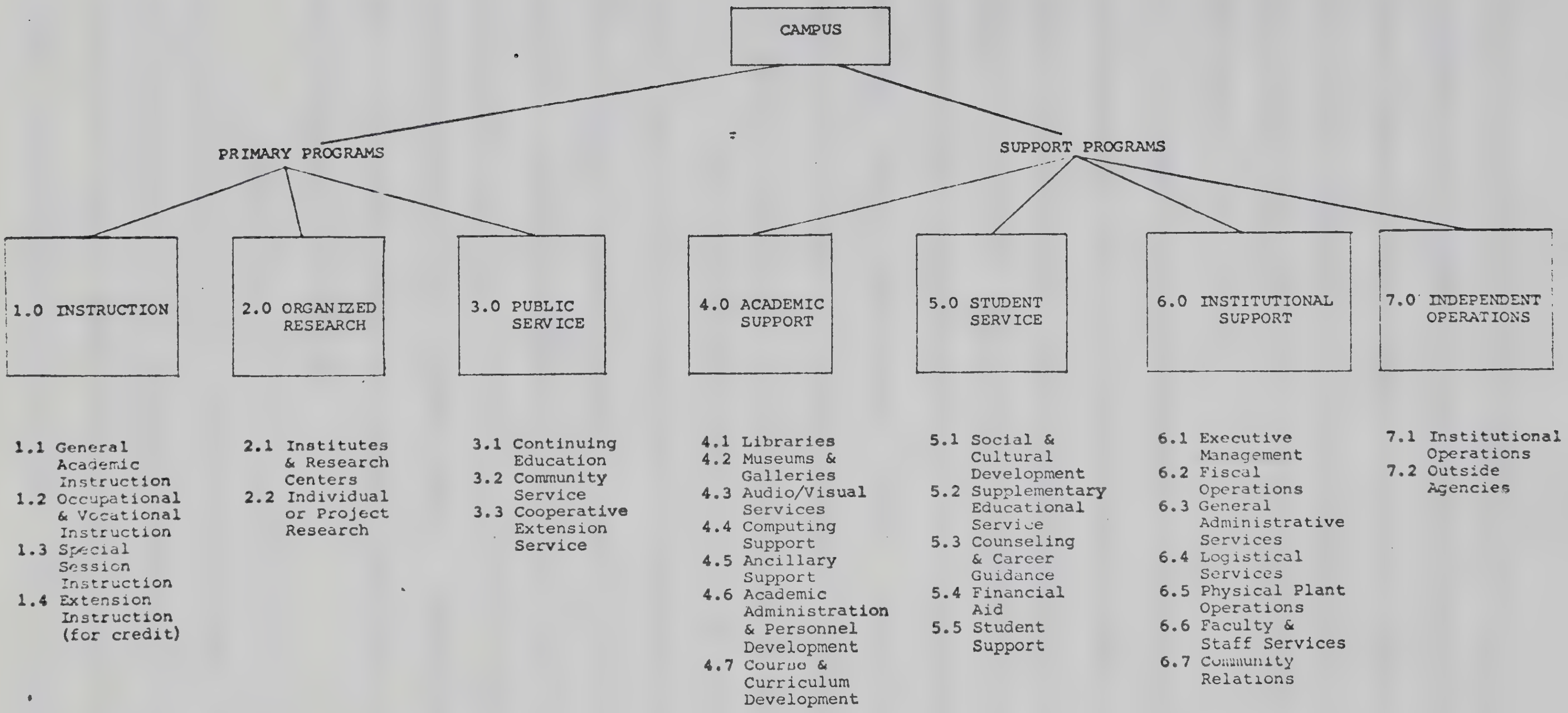
1. Lecture
2. Recitation & Discussion
3. Laboratory & Demonstration Instruction
4. Other Instruction

Space Types

1. Classroom
2. Class Laboratory
3. Research Laboratory
4. Office and Conference
5. Library
6. Museum/Gallery
7. Audio/Visual
8. Data Processing/Computer
9. Armory
10. Clinic
11. Demonstration
12. Field Service
13. Athletic-Physical Education
14. Assembly
15. Lounge
16. Merchandising
17. Recreation
18. Residential
19. Dining
20. Student Health
21. Medical Care
22. Physical Plant

Figure 1 (continued)

Source: TR-20, Figure 4.2


CAMPUS
PRIMARY PROGRAMS
SUPPORT PROGRAMS
1.0 INSTRUCTION
2.0 ORGANIZED RESEARCH
3.0 PUBLIC SERVICE
4.0 ACADEMIC SUPPORT
5.0 STUDENT SERVICE
6.0 INSTITUTIONAL SUPPORT
7.0 INDEPENDENT OPERATIONS
1.1 General Academic Instruction
1.2 Occupational & Vocational Instruction
1.3 Special Session Instruction
1.4 Extension Instruction (for credit)
2.1 Institutes & Research Centers
2.2 Individual or Project Research
3.1 Continuing Education
3.2 Community Service
3.3 Cooperative Extension Service
4.1 Libraries
4.2 Museums & Galleries
4.3 Audio/Visual Services
4.4 Computing Support
4.5 Ancillary Support
4.6 Academic Administration & Personnel Development
4.7 Course & Curriculum Development
5.1 Social & Cultural Development
5.2 Supplementary Educational Service
5.3 Counseling & Career Guidance
5.4 Financial Aid
5.5 Student Support
6.1 Executive Management
6.2 Fiscal Operations
6.3 General Administrative Services
6.4 Logistical Services
6.5 Physical Plant Operations
6.6 Faculty & Staff Services
6.7 Community Relations
7.1 Institutional Operations
7.2 Outside Agencies

Source: TR-20, Figure 4.3.

Figure 2

Organization of NCHEMS' Program Classification Structure

classified as either Comprehensive or Specialized models. A comprehensive model is one that includes student and faculty flows, space, staff, administration, support costs, curriculum, and other parameters. A specialized model, on the other hand, considers only one or two of the above areas, or other areas entirely.

RRPM is a comprehensive model that was initially developed in 1971. It has undergone field testing with pilot institutions. Other comprehensive, descriptive, physical process, analytical, simulation models include CAMPUS (1970), SEARCH/CAP:SC (1970), HELP/PLANTRAN (1970), and CEM (1969) (Weathersby, 1972). While other comprehensive models have, and are being developed, they have not yet undergone any degree of field testing in pilot institutions.

With specialized models one of the most common areas dealt with is enrollment forecasting and student flows. These types of models range in scope from determining specific course enrollments to inter-institutional enrollment forecasting and control models such as Washington's Higher Education Projection (HEEP) model. Other specialized models deal with such topics as Faculty Staffing and Activities, and Physical Facilities.

Regardless of the purpose of any simulation model one is cautioned that since the data base is a description of the institution it should, in order to be truly useful, "describe what is important to the institution" (Weathersby, 1972). Weathersby also cautions that decision-making is not

necessarily easier with the use of simulation models. He feels that with more information more alternatives may have to be considered and that things may be more difficult to ignore once they are written down. One is also reminded that simulation models are aids for management and not substitutes for leadership. Weathersby feels that regardless of the outcome of the implementation of a simulation model, the exercise itself can serve as a focal point for the organization of a planning process. Through the collection and dissemination of externally prescribed data, internal and continuing cooperation can result.

The Resource Requirements Prediction Model--An Overview

With respect to the structure of the model, Technical Report 20 (TR-20) states four basic characteristics which are:

> 1. RRPM-1 is a deterministic and descriptive simulation model.
>
> . . . .
>
> 2. RRPM-1 is a cost accounting model.
> 3. Student flow and faculty flow are not generated within the model.
>
> . . . .
>
> 4. The results of RRPM-1 . . . are a product of its structural relationships . . . and of its input values . . . .

In addition to the above stated characteristics it may be noted that RRPM-1.3 is not an optimization model. That is to say, the model will not give the best fit of

resources to the goals set for the institution. The model does not provide for the application of any value based judgements concerning the effectiveness or efficiency of the institution being modeled. However, by varying the inputs into the model to represent alternate decision possibilities on resource allocations, the administrative decision-maker can obtain an alternate description of what the institution would look like if these changes were actually to be introduced. In this way, RRPM-1.3 may be used for heuristic predictions of the "what if?" nature.

Using RRPM-1.3

There are three complete programs or modules that together make up RRPM-1.3. All three must be run sequentially, usually in three separate passes on the computer. The first program calculates the instructional expenses, the second program calculates the non-instructional expenses, and the third program is used to compile the output from the first two programs.

By partitioning or modularizing the model, three things were accomplished: first, the model required less computer resources; second, it allowed for dealing with the instructional phase of the institution without considering the non-instructional phase; and third, by separating the output portion of the model, it was possible to allow for the generation of few or many reports without necessitating the complete rerunning of the whole

model.

The importance of the second value of partitioning can not be over emphasized. In many institutions not all of the data are readily available. In such cases, where the non-instructional and support data are not yet available, the institution may still be able to obtain descriptive reports on their instructional operation. Through the selectivity possible in the generation of the reports with the third program, only the instructional phase of the operation need be outputed.

For the instructional program, there are eight different types of reports possible (see TR-19, Appendix A). Six of these reports can be aggregated at any one or all levels of the Program Classification Structure. The remaining report types (2) can not be generated for the various institutional levels but are run on the whole institution. These reports are construction costs and student enrollment by level of student and type of instruction.

The model has two modes of operation: prediction and experimental.

> The RRPM-1 pilot study indicated that the model may be operated in either of two modes: (1) as a prediction model, or (2) as an experimental device to examine and compare a number of planning alternatives. (TR-19)

In the prediction mode, the previously mentioned reports are possible, along with intermediate reports. In the experimental mode, the data at the end of each year can

be changed to make Heuristic Predictions. These Heuristic Predictions can be classified into four categories: Staffing Changes, Curriculum Changes, Admission Policy, and Other. (TR-19) The data changes entered may be either expressed as absolute changes or as percentage changes. The changes may either be in one value or an entire set of values. Technical Report-19 provides examples of various "what if?" questions that may be answered by the model.

When in the experimental mode, all of the proposed changes required to simulate a given "what if?" condition are called a case. The model allows for the handling of up to nine cases in one run. If further cases are desired, additional runs are required.

The Problem

Was RRPM-1.3 of benefit to the administration of the Grande Prairie Composite High School? Did it prove to be of any value in the planning carried out in that institution? In more detail, the questions posed were:

1. Were the minimally required data to run the model available, and how much difficulty was encountered in the collection and conversion of the data?
2. Was the output of the model useful to that institution at the school or system level in regard to:
    a. Decision Making
    b. Budget Preparation

c. Heuristic Predictions?

Delimitations

It was decided to run the model on a single year's data from the target institution. This limited the utility of the model for predictive purposes. However, since the emphasis was on the first problem, that of data collection, it was possible to operate the model using just one year's data.

In the model there were nine dimensions to be converted to dimensions meaningful in a secondary institution. Major categories became programs of study, such as : Matriculation, General Education, Business Education, and Technical/Vocational Education. Course Levels and Student Levels were both reduced to the three categories of Grade 10, Grade 11, and Grade 12. Note that second year Grade 12 students were still classified as Grade 12. The dimension of Discipline/Department was reduced to twelve and defined to be the subject departments within the school. The Faculty dimension was reduced to one category to cover teachers only. The Non-academic Staff dimension was retained as it was in the other pilot institution tests at four categories. Instructional Types were reduced to one category to include lecture only. See Appendix A for the complete list of the revised dimensions.

The Importance of the Problem

It was the prime intent of this project to determine the overall feasibility of using RRPM-1.3 in a secondary school environment. Feasibility here was defined in terms of data availability, ease of data collection, and evaluation of the usability of the model outputs by those administrators within the institution, and at the school board level, and in terms of the relative costs of implementation.

If indeed the model proved to be feasible, then it could make a valuable aid to decision makers throughout the field of public education. As a simulation model it would enable administrators to inexpensively evaluate alternative resource allocation decisions without the perhaps costly experiences of actual implementation. Further, the reports generated could in many cases provide another perspective for viewing the institution as it currently existed. The final use of the model rested in its predictive use once historical files had been assembled.

Because of the expense of data collection and conversion, it was appropriate to first attempt an evaluation of the model on the basis of one-year historical data. Thus a pilot project of this nature provided a less expensive means of determining whether to proceed with a full scale implementation of the model.

Constraints on the Project

In some cases it was not possible or economically feasible to collect the exact figures representing the institution. In these cases sampling was used as well as estimated figures provided by the administration of the school and the school board. In part then, the evaluation of the model was an evaluation of the accuracy of these samplings and estimations. In any further continuation of the project at the target institution, report discrepancies would result in revisions of these estimates until the reports as nearly as possible represented the reality of the institution. Such a continuation was outside of the scope of this thesis.

Benefits of the Project

While the prime benefit of the project was an evaluation of the feasibility of RRPM-1.3 for institutions of secondary education, other benefits were also envisaged. This project also results in a format for future management information systems at the school authority level as well as at the school board level. A further benefit lies in the utility of the model as a training device for the training of future administrators. While these secondary benefits were not within the scope of this thesis, their potential worth should not be discounted.

Summary

RRPM-1.3 was initially designed for post-secondary

institutions. However, it may be of use to planners and decision-makers in secondary school environments as well. In order to evaluate the model's utility in this second environment, this study was initiated.

RRPM-1.3 is a descriptive simulation model designed to aid higher level management in rapidly determining the resource implications of alternate policy and planning changes, as well as predicting future resource requirements based on past trends. Its ability to perform these functions is dependent on its ability to accurately reflect the institution as it exists. Thus, an important part of the study was an evaluation of the accuracy to which the model did reflect the institution.

Further, because of the nature of the pilot institution, the definition of many of the dimensions required modification. These types of modifications were found to be necessary in all of the previous pilot project tests carried out in the United States. Even with dimension modification, data had to be estimated, both because of the conversion problems of fitting to the model and because the data were not available or too expensive to otherwise obtain.

Chapter 2

METHODOLOGY

Introduction

RRPM-1.3 is a computer based simulation model. In its entirety it consists of three main sub-systems: Tracer-Trainer, Partial-Preprocessor, and RRPM-1.3. Tracer-Trainer is used as a simplified version of RRPM-1.3 designed specifically for the training of the personnel that will eventually be responsible for the maintenance and operation of the model. The Partial-Preprocessors, and there are two of them, are designed to pre-process or screen and validate the input data into RRPM 1.3. Technical Reports 22 and 23 provide the technical details concerning the operation and data requirements of the sub-systems. Because of the size of the target institution, and the omission of the historical data in the project, it was decided that pre-processing of the data was unnecessary. And while the Tracer-Trainer was of benefit to the project participants, the only sub-system used in the actual project was the first or RP module of the main sub-system of RRPM-1.3 itself.

The project consisted of four main steps:

1. Orientation of the target institution personnel.

2. Collection of the required data from the target institution.
3. The running of the collected data on the RRPM-1.3.
4. The providing of feedback to the target institution for the purpose of evaluation.

Orientation

An orientation trip was made to the institution for the purposes of familiarization of the staff to RRPM and to just what could be reasonably expected from it. A meeting was held with the principal, two vice-principals, and the business manager of the Grande Prairie High School as well as Dr. Richards and Doug Wessel. This meeting was followed up by a meeting with the Superintendant of Schools, Mr. Taylor.

The orientation also served another purpose in that it provided for an orientation to the institution for the project personnel. From it, the revisions and dimensions of the model were re-defined to more accurately fit the institution. An approximation of the availability of the required data was also derived. It was determined that not all of the data were directly available and, therefore, sampling of the student course loads was used to obtain the required data to create the Induced Course Load Matrix.

Data Collection

At this point, special coding forms were designed

and prepared (see Appendix B). A second visit to the target institution was made and the coding forms were filled. Table 1 shows the sources of the data collected. Table 1 also shows the data that were estimated along with the source of estimation. Appendix C provides a complete listing of the data collected from the target institution.

TABLE 1

SOURCES AND METHODS OF DATA COLLECTION

Data	Source	Method of Deriving Data*
Student enrollment	School office	R
	IBM scheduling files	C
	Guidance office	E,J,S
	Department representatives	R,J
Teaching workloads	School office	R
All salaries	Board office	R
Section sizes	School office	R
Other budget costs	School office	R
	Board office	R

*Legend: R - Records; E - Estimation from Records; J - Professional Judgement; S - Sampling; and C - Computer Files.

Data Analysis on RRPM-1.3

After the data were collected, they were keypunched and prepared for running on the RRPM-1.3. The preparation consisted of the correction of coding and keypunching errors. Ten copies of all of the output of the RRPM-1.3 were made for distribution to the personnel involved with

the evaluation of the model.

After the above stated runs were made with the model in the predict mode, the model was then run in the experimental mode to provide an example of the model's ability to provide heuristic predictions. Again ten copies of all of this output were made.

Evaluation of RRPM-1.3

In the pilot institutions used in the post-secondary studies validations of the model consisted of comparing the model generated data to historical data of the institution. Through a recycling process of the historical data those institutions were able to not just validate the model but they were also able to determine and make adjustments and modifications to the structure of the model itself.

However, in this project it was not feasible to collect the required historical data to facilitate the above method of validation. As such the evaluation of the model is not on an empirical basis. Instead, a heirarchy of evaluation was established to allow for the evaluation of the various reports by the personnel involved with the various decision-making tasks within the institution. This feedback form of evaluation also provided for the opportunity to suggest changes in the content and structure of the reports.

Thus, the evaluation consisted of an evaluation of the contents and accuracy of the reports generated. The

assessment was by one-to-one interviews with selected individuals. As estimations of some of the data were required, the accuracy of these estimations was also evaluated in terms of the fit of the model to the actual institution. It was not expected that the model would fit the institution completely, so the evaluation also solicited "professional opinions" regarding the value of a further continuation of support for the model within the institution.

Other Considerations

The RRPM system, as it was distributed, included the command language support to allow it to run under System/360 Operating System with a multi-programming environment. The computer used for this project, while being an IBM/360 Model 67 was not operating under the IBM OS but was rather running under the control of the Michigan Terminal System (MTS). Therefore, the command language provided was of no use to the project. New command modules and linkages were established to enable the model to operate in this environment.

Within the MTS environment conceptual changes in the model became possible. In the model it was suggested that the programs be stored on tape or in a catalogued procedure library and that the data be entered and stored either on card or magnetic tape files. With MTS it was possible to store the data and the required

programs on private disk files. In this way some economy of operation was possible as well as a reduction in the preparation and knowledge required to actually run the model.

The conversion to an MTS mode of operation did require that the third program (the report program) which was written in COBOL be modified to fit the COBOL-U compiler. This was also done.

Summary

The execution of the project was broken down into four steps: Orientation, Data Collection, Data Analysis, and Evaluation. In the second and fourth steps error was introduced into the project. In step two, estimations for missing data were made. In step four, the evaluation was mostly professional and, therefore, subjective as opposed to empirical. Nevertheless, such a first step pilot project evaluation approach is of use to the practicing administrator of the field.

Chapter 3

DESCRIPTION OF THE DATA

Introduction

For the purpose of this study the Grande Prairie Composite High School was selected as the Target institution. This school had, for the 1971-1972 term, a student population of 1,010 students. This school was the administrative responsibility of the Grande Prairie City School District No. 2357, and as such served the educational needs of primarily urban students. There were a total of fifty-eight academic staff in the school. This figure included one full-time administrator, one full-time counselor, three teacher-administrators, and three teacher-counselors.

For data gathering purposes, three sources of data were included: the school records and other sources within the school, the school board records, and IBM, which had been retained for the purpose of student scheduling for the school. The data collected were determined to be either student data or institutional data. The data requirements for the ICLM (Induced Course Load Matrix) were determined to be student data, while the remainder of the data were determined to be institutional data.

Student Data--The Induced Course Load Matrix

The ICLM has two basic functions in the model. First, it converts student enrolments, by programs into workloads on each department. Second, it provides a means of allocating departmental costs to student programs. Thus, the importance of the definition of programs could not be over emphasized. As was stated in Chapter One, a total of nine basic dimensions were required to generate the Model. Program or major was one of these dimensions.

Within the institution a policy of non-streaming was in effect. The student records included no reference to the types of program taken by each student. In order to provide the required data on student programs it was necessary to define and classify a sample of the course records of students. Definitions of student type by program and by grade-level were made. Appendix A provides a listing of these definitions. These definitions were determined to be operationally sound by the administration of the school, and were the result of collaboration with department heads as well as one of the vice-principals. Further validity of the definitions was provided by comparing the results of the sampling of the student records made using the definitions to other enrolment data provided by the school.

For the purpose of classification a sample of 251 student course records was drawn from the files of the guidance office of the school. Each student course record

selected was classified by grade-level (data from the files) and by type of program that each student seemed to best fit (the program definitions were created for this purpose). In the sample, 94 Grade 10 students, 87 Grade 11 students, and 70 Grade 12 students were selected. From these students it was determined that 47 percent of the students were Matriculation, 18 percent General, 14 percent Business Education and 22 percent Technical/Vocational. See Table 2 for the proportional distribution of the students sampled.

TABLE 2

RAW SCORES AND PERCENTAGES BY TOTAL

Grade	Matric.	General	Bus. Ed.	Tech/Voc.	Total
Grade X	n=50 20%	n=17 7%	n=5 2%	n=22 9%	n=94 38%
Grade XI	n=34 14%	n=17 7%	n=17 7%	n=19 8%	n=87 36%
Grade XII	n=35 14%	n=11 4%	n=12 5%	n=12 5%	n=70 28%
Total	n=119 47%	n=45 18%	n=34 14%	n=53 22%	n=251 100%

These proportional figures were then applied to the known enrolment figures of 376 Grade 10 students, 311 Grade 11 students and 323 Grade 12 students, to derive the following set of enrolment figures: 482 Matriculation students, 183 General students, 135 Business Education students, and 210 Technical/Vocational students. Table 3

provides a more detailed summary of the predicted enrolments by grade-level and by program, using both the sample and the known figures on the actual student enrolments.

TABLE 3

PROJECTED ENROLMENTS FROM GRADE SPECIFIC FIGURES

Grade	Matric.	General	Bus. Ed.	Tech/Voc.	Total
Grade X	199	68	19	90	376*
Grade XI	121	62	62	66	311*
Grade XII	162	53	54	54	323*
Total	482	153	135	210	1010*

*From School Records. All other figures are calculations based upon a combination of School Records and the data derived from sampling and displayed in Table 2.

Further information regarding the student enrolment patterns of the students was derived from the IBM student files used for the purpose of student scheduling in the school. From these data, it was possible to determine how many students at each grade-level were taking courses within each department and at what course-level. For example, Table 5 shows that for Grade 11 level courses in English, there were no Grade 10 students registered, 361 Grade 11 students registered and 49 Grade 12 students registered as taking one or more courses. Tables 4, 5, and 6 give the results of the crosstabulations from the IBM files.

TABLE 4

CROSSTABULATION OF GRADE X LEVEL COURSES BY COURSE

Grade of Student	Count Row Pct Col Pct Tot Pct	Course English Dept. 1.00	Social Science 2.00	Math Dept. 3.00	Science Dept. 4.00	Modern Lang. 5.00	Fine Arts 6.00	Phys. Ed. 7.00	Driver Ed. 8.00	Bus. Ed. 9.00	House Ec. 10.00	Tech-Voc. 11.00	Ac. Voc. 12.00	Row Total
Grade X	1.00	389 12.1 89.0 9.2	320 9.9 85.1 7.5	328 10.2 75.4 7.7	616 19.1 83.0 14.5	167 5.2 72.3 3.9	158 4.9 68.4 3.7	317 9.9 91.6 7.5	114 3.5 54.8 2.7	304 9.4 68.5 7.2	86 2.7 71.7 2.0	393 12.2 60.8 9.2	25 0.8 75.8 0.6	3217 75.7
Grade XI	2.00	47 5.7 10.8 1.1	49 5.9 13.0 1.2	97 11.8 22.3 2.3	112 13.6 15.1 2.6	45 5.5 19.5 1.1	52 6.3 22.5 1.2	27 3.3 7.8 0.6	74 9.0 35.6 1.7	112 13.6 25.2 2.6	29 3.5 24.2 0.7	173 21.0 26.8 4.1	8 1.0 24.2 0.2	825 19.4
Grade XII	3.00	1 0.5 0.2 0.0	7 3.4 1.9 0.2	10 4.8 2.3 0.2	14 6.8 1.9 0.3	19 9.2 8.2 0.4	21 10.1 9.1 0.5	2 1.0 0.6 0.0	20 9.7 9.6 0.5	28 13.5 6.3 0.7	5 2.4 4.2 0.1	80 38.6 12.4 1.9	0 0.0 0.0 0.0	207 4.9
	Column Total	437 10.3	376 8.8	435 10.2	742 17.5	231 5.4	231 5.4	346 8.1	208 4.9	444 10.4	120 2.8	646 15.2	33 0.8	4249 100.0

Source: IBM Scheduling Files--Student Masters.

TABLE 5

CROSSTABULATION OF GRADE XI LEVEL COURSES BY COURSE

Grade of Student	Count	Course										
	Row Pct Col Pct Tot Pct	English Dept. 1.00	Social Science 2.00	Math Dept. 3.00	Science Dept. 4.00	Modern Lang. 5.00	Fine Art 6.00	Phys. Ed. 7.00	Bus. Ed. 9.00	House Ec. 10.00	Tech-Voc. 11.00	Row Total
Grade X	1.00	0	0	0	0	0	0	0	0	0	1	1
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	
		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Grade XI	2.00	392	361	227	343	101	72	144	143	12	81	1876
		20.9	19.2	12.1	18.3	5.4	3.8	7.7	7.6	0.6	4.3	81.9
		88.9	84.5	75.7	80.1	86.3	83.7	90.0	66.8	92.3	77.9	
		17.1	15.8	9.9	15.0	4.4	3.1	6.3	6.2	0.5	3.5	
Grade XII	3.00	49	66	73	85	16	14	16	71	1	22	413
		11.9	16.0	17.7	20.6	3.9	3.4	3.9	17.2	0.2	5.3	18.0
		11.1	15.5	24.3	19.9	13.7	16.3	10.0	33.2	7.7	21.2	
		2.1	2.9	3.2	3.7	0.7	0.6	0.7	3.1	0.0	1.0	
	Column Total	441	427	300	428	117	86	160	214	13	104	2290
		19.3	18.6	13.1	18.7	5.1	3.8	7.0	9.3	0.6	4.5	100.0

Source: IBM Scheduling Files--Student Masters.

TABLE 6

CROSSTABULATION OF GRADE XII LEVEL COURSES BY COURSE

Grade of Student	Count	Course										
	Row Pct Col Pct Tot Pct	English Dept. 1.00	Social Science 2.00	Math Dept. 3.00	Science Dept. 4.00	Modern Lang. 5.00	Fine Arts 6.00	Phys. Ed. 7.00	Bus. Ed. 9.00	House Ec. 10.00	Tech-Voc. 11.00	Row Total
Grade XI	2.00	1 4.8 0.4 0.1	2 9.5 1.2 0.2	1 4.8 0.5 0.1	3 14.3 1.0 0.2	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	9 42.9 7.3 0.7	0 0.0 0.0 0.0	5 23.8 8.8 0.4	21 1.6
Grade XII	3.00	259 20.3 99.6 20.0	170 13.3 98.8 13.1	207 16.2 99.5 16.0	288 22.6 99.0 22.2	86 6.7 100.0 6.6	33 2.6 100.0 2.5	59 4.6 100.0 4.5	115 9.0 92.7 8.9	7 0.5 100.0 0.5	52 4.1 91.2 4.0	1276 98.4
	Column Total	260 20.0	172 13.3	208 16.0	291 22.4	86 6.6	33 2.5	59 4.5	124 9.6	7 0.5	57 4.4	1297 100.0

Source: IBM Scheduling Files--Student Masters.

Along with the information provided about the student population from the samples drawn from the guidance files and the IBM files, each department in the school was approached for further information. This information was regarding the enrolment patterns of each student type within each department. At that time, the operational definitions for each type of student, by program and grade-level were further substantiated by the departmental representative interviewed. From the departmental representatives it was determined how many, or what proportion of each type of student was enroled in each course, by course level.

Finally, using the above collected data along with some crosstabulations of student enrolments by department by course level and by student level, taken from the IBM files it was possible to predict the actual enrolments. From the actual enrolment figures it was then possible to determine the "typical student" load on each department in terms of credit loads. These data constituted the ICLM input into the model.

Institutional Data

The institutional data on each department were collected from the departmental representative, the school central office, and the school board office. For different departments the data collected came from different sources. For example: the budget data came from either the

department involved or from the school board office.

In the school office there was a further source of data in the form of classroom scheduling boards and teacher assignment boards. These boards were color-coded by department and each classroom was identified by the department utilizing it for each period. The teaching loads of each teacher were identifiable by the department in which that teacher had teaching responsibilities. In determining the actual teaching load within each department, the following method was used. Each teacher was pro-rated on the proportion of their teaching assignment with each department. Since each teacher was assigned to a department by the school, their preparation time was charged to their assigned department and kept independent of their actual teaching assignment. For example, a teacher assigned to the English department that taught six periods of English and one period of Math would be allocated in the following manner: one-eighth of a Math teacher, and seven-eighths of an English teacher, and would be rated within the English department as having a teaching load of 0.857 (six out of seven class periods assigned were actually spent teaching English), and within the Math department as having a teaching load of 1.0 (all class periods assigned were actually spent teaching Math). The figures for each teacher were proportionally weighted to provide overall teacher loads for each department. Table 7 shows the results of those calculations concerning the typical teacher contact hours or work load per week.

All staff salary data were obtained from the school board office. The salary of each teacher was pro-rated according to that teacher's teaching assignments in each department. Weighted averages were then derived to represent the average teaching salary of a teacher in each department. Again, like the determination of teacher contact hours, preparation time and the proportion of the salary involved was assigned to that department to which the teacher was formally assigned.

TABLE 7

STAFFING DATA BY DEPARTMENT

Department	Total Staff	Average Salary	Average Teaching Load
Math.	5.75	$12048.00	0.83%
English	7.5	$ 9172.00	0.75%
Social Sciences	6.25	$ 9880.00	0.80%
Home Ec.	1.25	$12813.00	0.80%
Modern Languages	3.25	$10850.00	0.77%
Phys. Ed.	3.75	$10779.00	0.69%
Fine Arts	2.375	$11086.00	0.69%
Tech./Voc.	8.125	$11364.00	0.96%
Ac. Occ.	2.0	$ 9265.00	0.875%
Bus. Ed.	4.875	$ 9574.00	0.75%
Science	6.25	$10170.00	0.76%
Driver Ed.	0.5	$10875.00	1.0%

See Table 1 (p. 17) for data sources.

As occured with the student data, where the institutional data did not specifically exist for the requirements of the model, the person, within the institution who best knew the area in question was solicited for his or her professional judgements or solutions. In this way, while all of the data collected were not derived from active files, they were obtained from the best and most reliable sources available. Table 1 provides a summary of the data types collected along with the sources used to collect the data. Whenever and wherever possible, the data collected were validated by cross-referencing to other data or by the professional judgements of those people in the best positions to know.

Summary of the Data Collection

Both student data and institutional data were collected from three sources: the school, the school board, and the IBM student scheduling files. Within the school and school board, whenever the data did not specifically exist, professional, knowledgeable, and whenever possible, substantiated judgement was used. In collecting the required data to create the ICLM three sources were used as well: the guidance files, the departmental and classroom lists, and the IBM scheduling files. Within the school, the classroom scheduling board and the teacher timetable and assignment boards also provided much valuable data about the institution.

Departmental records, although not designed to provide the same type of information usually available from a university or college department, were nevertheless useful in determining student enrolment patterns and average section size data.

Description of the Institution

Enrolment. Within the school there were 1,010 students. There were 376 Grade 10's, 311 Grade 11's, and 323 Grade 12's. There were a total of 482 students defined as Matriculation students, 183 General Education students, 135 Business Education students, and 210 Technical/Vocational students. Further breakdowns on student enrolment patterns by course and grade levels are available from Tables 2, 3, 4, 5, and 6.

Staff workloads and salaries. Within the school there were twelve departments. All data collected on staffing were aggregated to the departmental level for twelve departments. Total number of staff (FTES), average salary of staff and average teaching load (to become Faculty Contact Hours) were collected and are shown on Table 7 by department. The average teaching load was determined by dividing the total number of periods that were taught in a department by the total number of periods that teachers were assigned to a department (including preparation time), per week.

Space assignment by department. The classrooms were assigned by department even if the department was not actively using the space. In the case of the general lecture type of classrooms, some were assigned to different departments throughout the day. In those cases the classroom space was pro-rated by department. However, in cases where the classrooms were for specific purposes, such as the school bookstore which was a part of the merchandizing space, the department of Business Education was charged for full use of the space, even though the space was not fully utilized.

In all cases, the occupancy and departmental responsibility for the space was determined from the classroom assignment board in the school office. As was stated earlier, this board was color coded by department for this purpose. Only summary figures by department were required for the model, so the data, in detail, had to be summarized and pro-rated for classroom sizes, classroom stations and for occupancy rates.

All assigned instructional space within the institution was defined to be either classroom space or classroom-laboratory space. A classroom was that space that was used for multi-purpose instruction while a classroom-laboratory was defined as that space that was restricted for use to a specific type or subject area of instruction. No individual course was broken down into the proportion of time required for classroom and laboratory

instruction, but was determined to be either one or the other as judged by the type of space occupied. Due to the impossibility of determining an accurate mix of instructional type (individual teacher preference and lack of records) only one instructional type was used on the pilot project regardless of the type of space being occupied.

Primary programs. The school, for the purpose of this study was involved in general Academic Instruction only. While the school was also involved in space sharing agreements with the Regional Community College, data on this phase of activity were not available. Likewise, data on school involvement in other school activities were not available in the detail required to run the model.

Support programs. There were several reasons for excluding this portion of the school's activities from the model in this pilot project. In some cases, the required data were not available in the form required by the support program categories employed in the model. In other cases the support program activities were a function of the school system and not the individual school. In these cases the data would have to be pro-rated to determine the proportional contribution by the school and that was not even logical for categories such as Academic Staff Support.

Since the purpose of this pilot project was to provide a first look at the applicability of RRPM to

institutions of Secondary Education, it was felt that running the instructional phase of the institution on the model would provide sufficient information for an initial evaluation. Therefore none of the support programs were involved in the pilot project.

Summary and Discussion

In general, some difficulty in representing the school in the model occured through differences in definitions as they applied to the school. In some cases, even with re-definition, the data were still not available.

RRPM regards an educational institution in terms of primary and support programs. When dealing with a secondary educational institution some of these programs are unapplicable. For example, organized research, academic support, and independent operations are whole programs that are non-applicable to any secondary institution.

Within other programs re-definition of sub-programs or components is necessary, on occasion, while other components are non-applicable regardless of re-definition (student financial support). With still other components, while these components are present, they are not formally supported by the institution with respect to resource allocation (extra-curricular activities involving staff participation, and community relations). Therefore the data that were collected on the school to run the model

did not reflect the totality of the institution. In Chapter Four, under Implications, a more detailed examination of the model and its applicability to an institution of this type is undertaken.

Chapter 4

OUTPUT FROM THE MODEL

Introduction

Since only the intermediate output from the "RP" module of the model was required and used in the pilot study, the discussion in this chapter will be limited to only that output. However the model does allow for much more extensive reporting with the inclusion of further data and through the utilization of the "RR" module.

Appendix D includes all of the intermediate output from the first module of the model. Appendix E provides that intermediate output that changed through the inclusion of alternate faculty load data. This second run of the model was done to provide an example of the results of a simple heruistic prediction which took the form of: "WHAT would be the staffing requirements by department IF the staffing or faculty load were 0.875 throughout the whole school?"

Intermediate Output by Instructional Type

This output was essentially a crosstabulation of both Student Data and Faculty Data with Department by Level of Instruction, Type of Instruction and Type of

Instructor (Teacher). In the project there was only one type of instruction used and only one category of Instructor Type used. There were, however, three Levels of Instruction used. It may be noted that due to the formal considerations inherent within the RP Module that only two of the three Levels of instruction are displayed on each page of this portion of the output. The output from the project is less complex than that provided by the original WICHE test institutions.

Student data. Data were taken from the ICLM and the enrolment data to provide Credit Hours (CR. HOURS). The Contact Credit (CT/CR) Ratio dealt with the ratio of instructional credit to instructional time requirements. Since, in the target institution, over a full year of instruction, forty minutes of instruction were required to provide one credit, this ration became equal to 40 ÷ 60 or 0.67. When this CT/CR Ration was applied to the Credit Hours the result became the Contact (CT) Hours. For example, Grade 10 English required a total of 2611.8 credit hours over a full year. This resulted in a total contact hours requirement on the institution of 1749.9 hours. When this total contact hour requirement was divided by the average section size for Grade 10 level of instruction (in this case, 26.1), the result was the total faculty or teaching contact hours required to fulfil the requirements for Grade 10 English.

For Student Data the following data were required as input: ICLM data representing "Typical student load" for the particular department for each Level of Instruction, student enrolment data for each Level of Instruction, the Contact Credit Ratio for the institution, and the average section size for each Level of Instruction within the Department.

From the above required Data the following Data were generated: Credit Hours and Contact Hours.

Faculty data. These data were in part a result of the computations from the Student Data, above. Since there was only one Instructional Rank (Teacher), 100 percent of the instruction was carried out by that rank. Thus the Faculty Contact Hours provided by that Instructional Rank were equal to the Faculty Contact Hours calculated from the Student Data.

The Faculty Load was constant throughout each Department and was taken from the input data directly without computation. When these data were divided into the Faculty Contact Hours the result was the Full Time Equivalent Staff required to meet the institutional commitments to the department for the given level of instruction. In the case of Grade 10 English, the Faculty Contact Hours (67.05) were divided by the Faculty Load (23.80) to derive a Full Time Equivalent Staff requirement of 2.68.

Intermediate Output by Instructional Type Summary

Summary figures on both Faculty and Student data were provided throughout the Intermediate Output. For each Level of Instruction, cross-tabulations were provided for Instructional Type by Faculty Rank of Instructor. Within the scope of the project, only one Faculty Rank and one Instructional Type existed. Therefore, most of the possible cross-tabulations were not included.

Intermediate Output by Faculty Rank

The purpose of this portion of the output was to provide summary salary figures by department and by instructional rank where applicable. Sub-totals were again provided in order to allow for departmental salaries for all instructional ranks. In this project there was only one instructional rank. However, this output did provide a convenient summary for total FTES by Department.

The data required were the FTES generated for the Intermediate Output by Instructional Type, and the Faculty Salaries which were part of the input data. The output consisted of the resulting total salaries for each Faculty rank within each Department.

Intermediate Output by Department for Non-academic Staff

Within the project it was decided not to provide

data on the Non-academic Staffing requirements for two reasons. First, data indicating the distribution of non-academic staff workloads by department did not exist. Second, within the school the salaries of non-academic staff were not charged to any department but were considered a part of the administrative costs of the school district.

Therefore, this portion of the output showed no data. However, if the data had been available, the output here for each department would have consisted of: the total FTES and resulting salary requirement for each non-academic rank along with a total FTES and resulting total salary requirement for the department.

Intermediate Output by Department (Costs)

In this final portion of the intermediate output of the "RP" module, Supply, Travel, and Equipment costs were totaled by department. These Data were taken directly from the input data and displayed to allow for visual checking for accuracy of transcription. In later modules of the model these data would be used, but not in this module.

Summary and Discussion

The data presented in the intermediate output should have provided little information that was new to the administration of the institution. The purpose of this output was to provide the opportunity for cross-checking and validation of the input data. This output merely

presented a mathematical representation of the instructional phase of the institution as it existed at that point in time when the data were collected.

It was noted that data were not generated for the department of Academic/Occupational. This was because that department was not assigned any student credit load in the ICLM input data. Without those data, the model could not generate any Student Credit Hours regardless of enrolment. Therefore FTES Faculty requirements could not be generated and Academic/Occupational did not register in the model as having any Level of Instruction, nor any staffing requirements at all.

As was stated in Chapter Five, under Accuracy of Representation, the FTES generated from the model were inconsistent with those in actual use within the institution. This inconsistency resulted in a re-appraisal of some of the input data used to generate the ICLM. While corrections to the data used in the ICLM are not within the scope of the project, this did serve to point out one of the advantages of intermediate output, that of checking purposes.

The intermediate output made available through the generation of the RP module of the model proved to be sufficient to allow the evaluation of the model in its ability to mathematically represent the pilot institution. The evaluation in Chapter Five was based on the data and output listed in this chapter.

Chapter 5

EVALUATION

Overview of the Evaluation of the Model

The Resource Requirements Prediction Model is a mathematical model that is intended to represent an educational institution. Its ability to represent an institution is, in part, directly related to the quality of data that are collected and the compatibility of the definitions of the institution to those used in the basic design of the model. It was indicated in the reports published by the original WICHE test institutions that not all of the data were available. Such was also the situation in the pilot project conducted at the Grande Prairie Composite High School. In this pilot project, as in the WICHE pilot projects, where actual data were not available, estimations were used. The accuracy of these estimations was one part of the evaluation of the model.

The model was also evaluated with reference to its utility to administrators at various levels of responsibility within the school organization. Along with views as to the utility of the model, emphasis was also placed on ideas for improvements to the model, both in terms of accuracy and utility.

The evaluation was made using comparisons between model generated data and actual data, and by interviewing the following administrative personnel: the principal, two assistant principals, the business manager of the school, and also the superintendant, secretary-treasurer and maintenance supervisor of the school board. In all cases, individual interviews and group sessions were involved.

Accuracy of Representation

As was stated earlier, where full data were not available, or too costly in terms of time required to collect, sampling and estimation was used. (See Table 1 for actual data sources.) The method used to check the accuracy of the data collected was to compare the intermediate report results of the RP module (see Appendix D) with other known facts about the institution. In terms of model sensitivity with respect to data input, the data required to generate the Induced Course Load Matrix (ICLM) was the most sensitive. The accuracy of these data was determined, in part, by comparing the Teacher requirements generated by the model to the teachers actually required. Table 8 shows generated teacher FTES and actual teacher FTES. Some of the figures compared quite well while others did not. These errors were in part due to sampling error and definitional error in the definition of student types. (See Appendix A for definitions used in the project.) The dependance of the model on the ICLM

data was shown in Chapter Four, where the faculty data were a result, in part, of the student data which was a direct result of the ICLM.

TABLE 8

ACTUAL TEACHER FTES VERSUS GENERATED TEACHER FTES

	Actual Teacher FTES*	Model Generated Teacher FTES**
English	7.5	7.46
Social Science	6.25	5.51
Math.	5.75	5.96
Science	6.25	6.59
Modern Lang.	3.25	3.2
Fine Arts	2.375	2.78
Phys. Ed.	3.75	3.74
Driver Ed.	0.5	0.46
Bus. Ed.	4.875	3.52
House Ed.	1.25	0.94
Tech./Voc.	8.125	7.97
Ac. Occ.	2.0	0.0

*From Table 7.

**From Appendix D, pp.

Further errors were introduced into the model from three other sources. In some departments, courses were not weighted properly in terms of credit values, for example, some Grade 11 science courses were treated as five credit

courses when in fact they were three credit courses. The ICLM was also distorted by the presence of the major called Academic Occupational and its accompanying non-credit courses in Academic Occupational. As was noted in the intermediate output, all Academic Occupational entries except the cost figures showed this major or department as having no teaching activity associated with it. Thus, while there did exist a demand for resources, no demand could be shown because of the no credit allotment to the courses. The other source of error that distorted the generated faculty loads came from the calculated faculty load data.

When faculty loads were being calculated for each department the definitions employed did not allow for the pro-rating of the preparation time allowed for each teacher over their entire teaching load in those cases where that teacher taught courses in more than one department. Regardless of the shared teaching responsibilities of any teacher, each was assigned to one department by the school. Therefore, each teacher's preparation time was charged to that department to which the teacher was assigned. This method of determining staff load proved to be particularly sensitive in the case of the Science Department in that while teachers within the Science Department also taught outside of their department, teachers from other departments did not teach courses within the Science Department. Without pro-rating preparation time any teacher's time spent teaching in another department

created an appearance of efficiency for the receiving department and at the same time created an impression of inefficiency for the donor department.

The above point illustrates one way in which the needs of the model in terms of data could be better served by collecting the data in a form other than that which would be normally used by the school. For other reporting purposes within the school, teaching loads are determined by department without pro-rating by department. But for data collection purposes for the RRPM pro-rating would have given a representation with more accuracy.

While the model did approximate the school it did not accurately represent the school. Data accuracy and data definition were the two main contributers to any mis-representations.

The Utility of the RRPM at the School Level

Most of the data required to run the model were collected from the school. Therefore it was felt by the school administration that there was very little new to them in the output and reports generated by the model that they did not already know. In this way, it was felt that the model had little to offer in the way of new information for aiding in decision-making. However, it was also felt that the time required to generate the information for other purposes could also be used to prepare the data required to generate the model for the

school system level of administration. It was also felt that the report format and content was useful to the school. An interest was expressed in the ability of the model to predict future requirements once a sufficient historical file had been created.

Even with the predictive ability of the model caution was stressed in the area of enrolment prediction by department. It was pointed out that enrolments within many courses are determined more by the personality type of the teacher than by formal requirements.

From interviews with various administrators within the school it was felt that accuracy of representation could have been further enhanced by defining the departments by functional areas and resource consumption rather than by subject area. For example, within Business Education, there are two types of courses that are taught; those that require capital equipment such as Business Machines and Typing, and those types of courses that do not require any significant expenditure on capital equipment such as Bookkeeping and Shorthand. It was felt that had these types of courses, for example, not been aggregated into one department, a more accurate and real representation of costs would have been possible.

In summary, the utility of the model at the school level, was questioned. In the area of instructional support within the school, since such things as caretaking and maintenance were handled by the central office, the

resulting report information was of little value to the Business Manager. And since the duties of the clerical staff changed from week to week, it would be almost impossible to pro-rate them to any department with any accuracy. In general, the data provided by the RRPM was either redundant, or of no direct concern to the administration of the school.

The Utility of the RRPM at the School System Level

The output of the RRPM was received by the system level administration with great interest. There the information was felt to be far from redundant. In the case of the student and faculty reports, the information was regarded as new and not previously available. Thus, while the accuracy of some of the data (FTES) was questioned, the value of these data was not questioned. It was suggested that the school board would be interested in further work being directed toward the testing and evaluation of the model.

The superintendent found the data to be of particular value in the area of staffing. In the area of predicting future resource requirements, it was felt that at the system level the model would be very useful. It was suggested that the model might be of assistance in the area of deployment of resources should school expansion be of such a nature as to require the construction of another high school. Here, through a combination of an

analysis of the student loads as portrayed by the ICLM and the utilization of the model in the experimental mode, heuristic predictions could aid in a minimization of duplication of resources.

The superintendent and the secretary-treasurer were both interested in the raw data that were used as input to the model. They felt that since much of these input data were new to them, the supplemental reports of the RP module could be enhanced by the inclusion of the raw data in the reports. For example, they would have liked to have seen the student enrolments for each course level by each department included with the Student and Faculty reports.

It was further suggested by the secretary-treasurer that more sub-totals could be provided with the cost data presented in the reports. In the area of support programs it was hoped that future developments could include the inclusion of some of these types of programs. Here, currently, little data concerning costs of support program operations were available and a system of pro-rating the costs was not yet operational. In general, the data provided on costs were felt to be of utility in the preparation of reports for the Department of Education and budgets for the school board.

It was hoped that if that school system could continue to use the model, the model could be expanded to include the elementary and junior high schools. In that way, the utility of the model could be improved through

further utilization.

Possible Improvements

The first problem faced by the researcher was one of accuracy. It was suggested that in any further work with the model, more support in the area of data collection could result in more accuracy. Likewise, a further effort in the redefinition of some of the dimensions used in the model could result in a more accurate representation of the institution. For example, a careful analysis of the teaching staff could result in the expansion of the dimension of Faculty Type from one element, as used in the pilot project, to a multi-element dimension.

It was also suggested that, if the departments were redefined along resource requirements rather than along the traditional lines of subject content, more accuracy in determining resource requirements could be achieved. Such a step would require that the ICLM be completely re-generated, and as such would require careful consideration before initiation. Further, while this idea may have merit for school resource allocation, it would render the reports virtually useless at the system reporting level where much of the format controlling reporting to the department of education is by subject defined departments and not by resource consumption defined departments.

The second problem faced by the researcher was that

of report content and formating. Here it was felt that, at least at the system level, some of the raw data on student enrolments could have been included. Likewise, and again at the system level, more summaries and crosstabulations of the cost data would have been useful.

The problem of re-definition of the Campus Activities: support and primary, was felt in the incompleteness of the reports. Had these activities been more carefully re-defined to fit the test environment, further valuable inclusions in the reports could have been possible. It was noted that even with re-definition, data gathering would have been a considerable task as most of the support data would have to be generated from scattered source documents.

Summary

While the model generation for the pilot project did lack accuracy in some areas, it was felt that not only was the model still worth while but that it was also worth continuing with development and expansion of the model. The model was felt to be of more use at the system level than at the school level. It was felt that the RRPM could be used at the level of secondary educational institutions. While definitional changes had to be made, the concept of the typical student load, as used by the Induced Course Load Matrix, would work for secondary education. Since this ICLM is the center and controlling

part of the Resource Requirements Prediction Model it follows that the remainder of the model was also applicable to this institution of secondary education.

The whole concept of an Induced Course Load Matrix becomes contigent upon the philosophy of the institution being modeled in the question of streaming. An ICLM would be much easier to generate with accuracy in an institution which uses a streaming approach to scheduling. Likewise, in an environment of open, full freedom of choice of offering for all students, the ICLM may be impossible to generate on any long term bases due to varying patterns of student choice, if patterns exist at all. In the year following the initial generation of the model, such a shift away from streaming has taken place within the target institution. Therefore, any follow-up generation of the model would have this problem to deal with as well.

A further look at the implications of this pilot project is undertaken in Chapter Six.

Chapter 6

SUMMARY, IMPLICATIONS AND CONCLUSIONS

Summary

The Resource Requirements Prediction Model was designed to provide an administrative decision-making aid for administrators of post-secondary educational institutions. The intent of the designers at WICHE was to provide a mathematical representation of the institutions using the model. It seemed reasonable that this same model could be of use to administrators of secondary institutions. However, the National Center for Higher Education Management Systems had not made any attempt to evaluate the potential of the model for the secondary level of educational institutions.

Therefore it became the intent of this thesis to report on a pilot project to evaluate the potential utility of the RRPM to secondary educational institutions. It was found that many of the dimensions used in the model required modification and re-definition in order to make the model usable in the test institution of the Grande Prairie Composite High School. Furthermore, it was necessary to delete some of the primary program capabilities of the model as they were unapplicable in the test

institution environment.

All of the secondary program capability of the model was also deleted from the pilot project. The reasons for this were three-fold: lack of data, cost in terms of collection time of data, and the extensive re-definition of the categories to fit the program structures found in the test institution.

The test made of the model, therefore, was a limited test of the Primary Instructional Programs of the High School only. This limitation, imposed by incompatibility and lack of data, required that only the first module of the RRPM Sub-system be used. Thus the reports that were provided to the School principal, vice principals, business manager, superintendent, and secretary-treasurer were limited to reports dealing with the instructional programs of the school only.

The various support programs in which the institution participated were not included in the pilot project because most of them were considered to be a part of the school board's policy of community involvement and costing figures were not available. In the area of Adult and Continuing Education, the administration of these programs was the mandate of the local Regional College. Therefore, data on costs and utilization were not available. Such costs actually involved were calculated as being part of the over-all institutional operating expenditures.

Implications

The testing of the model in this pilot project did not include any attempt to provide projections. The reason for this was the lack of historical data. However, in the light of the favour that the limited test was received by the administration of the test institution, it may be well worth the time to conduct further tests in that, or in a similar, test environment in order to further examine the potential capabilities of the model to provide predictions of future growth and resource requirements. Likewise, such a future project could address itself to the problems of the re-definition of some of the support programs. The current testing results were obviously incomplete in their representation of the whole institution.

As an aid to further testing of the model, it is suggested that several intermediate data collection forms be used. The experience of this test project has shown the inadequacy of the intermediate forms used in this test and illustrated in Appendix B.

Conclusions

Even in the limited test experience provided by this pilot project the value of RRPM to secondary educational institutions has shown itself. The act of collecting the data resulted in several intermediate reports being generated at the request of the pilot institution.

These reports included an "Interim Report on Enrolments--Grande Prairie Composite High School" (see Appendix F) and a report on teaching salary deployment by department, within the school. In this way the test project provided a service to the school in the data was were uncovered.

A further service was provided to the test institution in the reports that were generated by the model. The response of the administration to these reports, as was discussed in Chapter Five, demonstrated the value of them, even in their limited presentation form.

From this, it may be concluded, that even within the limited scope of the pilot project, the RRPM has potential as an administrative aid in decision-making within secondary educational institutions.

REFERENCES

REFERENCES

A Resource Requirements Prediction Model (RRPM-1)--An Introduction to the Model, NCHEMS Technical Report No. 19 (Boulder, Colorado: NCHEMS, 1971).

A Resource Requirements Prediction Model (RRPM-1)--Guide for the Project Manager, NCHEMS Technical Report No. 20 (Boulder, Colorado: NCHEMS, 1971).

A Resource Requirements Prediction Model (RRPM-1)--Report on the Pilot Studies, NCHEMS Technical Report No. 21 (Boulder, Colorado: NCHEMS, 1971).

A Resource Requirements Prediction Model (RRPM-1)--Programmer's Manual, NCHEMS Technical Report No. 22 (Boulder, Colorado: NCHEMS, 1971).

A Resource Requirements Prediction Model (RRPM-1)--Input Specifications, NCHEMS Technical Report No. 23 (Boulder, Colorado: NCHEMS, 1971).

Gulko, Warren W. Program Classification Structure Preliminary Edition for Review. WICHE Management Information Systems Program NCHEMS (Boulder, Colorado: NCHEMS, 1970).

Weathersby, George B. "Tools and Techniques for Planning and Resource Allocation." Paper read at the National Forum on New Planning and Management Practices in Higher Education, January 1972, Denver Colarado. (Mimeographed.)

APPENDIX A

MODIFICATIONS AND DEFINITIONS

1. MODIFICATIONS TO DIMENSIONS OF RRPM-1.3

Major

Matriculation
General
Business Education
Technical/Vocational Education

Course Levels

Grade 10
Grade 11
Grade 12

Student Levels

Grade 10
Grade 11
Grade 12 (first and second year)

Discipline/Departments

English
Social Sciences
Mathematics
Science
Modern Languages
Fine Arts
Physical Education
Driver Education
Business Education
Household Economics
Technical/Vocational Education
Academic Occupational

Faculty Ranks

Teacher

Non-academic Staff Ranks

Professional/Management
Technical/Craft
Clerical/Secretarial
Maintenance/Caretaking

Instructional Types

Lecture

Space Types

Classroom
Classroom-Laboratory

2. INSTITUTIONAL PROGRAMS RETAINED

Primary Programs

General Academic Instruction
Occupational and Vocational Instruction

Support Programs

None were retained.

3. DEFINITIONS OF STUDENT TYPE USED FOR DETERMINING STUDENT ENROLLEMNT PATTERNS

Matriculation: Grade X. All those students taking English 10 or 13, Social Studies, Math 10 and at least two of Biology 10, Chemistry 10, or Physics 10. Further support would be indicated if the student were taking a second language.

Matriculation: Grade XI. Those students continuing with the same pattern established at the Grade X level. (This may include repeats of Grade X courses.)

Matriculation: Grade XII. Those students taking Grade XII level Social Studies, English, one or more Math and one or more Science.

Business Ed.: Grade X. Those students taking three or more Business Ed. modules.

Business Ed.: Grade XI. Those students taking either Accounting or Typing and two or more other Business Ed. courses.

Business Ed.: Grade XII. Those students taking Accounting or Typing, and two or more other Business Ed. courses.

Tech./Voc.: Grade X. All Academic Occupational students and those students taking four or more Technical modules and not otherwise classified as Matriculation Students.

Tech./Voc.: Grade XI. All students taking one or more Grade XI level Tech./Voc. courses and not otherwise classified as Matriculation students.

Tech./Voc.: Grade XII. All students taking one or more Grade XII level Tech./Voc. courses and not otherwise classified as Matriculation students.

General: All Grades. All those students not otherwise classifiable.

APPENDIX B

DATA COLLECTION SHEETS

DATA COLLECTION SHEET RRPM TYPE 1*

Student Data

Program (Major
___ Matric.
___ General
___ Bus. Ed.
___ Tech./Voc.

Dept. (Disc)
___ Ac. Occ.
___ Bus. Ed.
___ English
___ Fine Arts
___ Home Ec.
___ Math.
___ Modern Lang.
___ Phys. Ed.
___ Social Sciences
___ Science
___ Tech./Voc.
___ Driver Ed.

Grade 10 Level Courses

Number of Grade 10 students: ____ number of credits: ____
Number of Grade 11 students: ____ number of credits: ____
Number of Grade 12 students: ____ number of credits: ____

Grade 11 Level Courses

Number of Grade 11 students: ____ number of credits: ____
Number of Grade 12 students: ____ number of credits: ____

Grade 12 Level Courses

Number of Grade 12 students: ____ number of credits: ____

Data Sources

____

____

---

*N.B. This sheet is repeated as often as is required in order to provide coverage of all students, to a maximum of 48 sheets per department.

DATA COLLECTION SHEET RRPM TYPE 2

Departmental Data

Dept. (Disc)
___ Ac. Occ.
___ Bus. Ed.
___ English
___ Fine Arts
___ Home Ec.
___ Math.
___ Modern Lang.
___ Phys. Ed.
___ Social Sciences
___ Science
___ Tech./Voc.
___ Driver Ed.

Grade 10 level courses average section size: Lecture ____ Lab. ____ Other ____

Grade 11 level courses average section size: Lecture ____ Lab. ____ Other ____

Grade 12 level courses average section size: Lecture ____ Lab. ____ Other ____

Grade 10 level courses average proportion of: $\frac{\text{Lecture time}}{\text{Total time}}$ ____

Grade 11 level courses average proportion of: $\frac{\text{Lecture time}}{\text{Total time}}$ ____

Grade 12 level courses average proportion of: $\frac{\text{Lecture time}}{\text{Total time}}$ ____

Average Teacher Data

Average salary ________

Average teaching load, i.e., $\frac{\text{Teaching time in BLOCKS}}{8}$

No. of teachers in Dept. ______

Total Supply Budget $________

Total Travel Budget $________

Total Equipt. Budget $________

Dept. Head Bonus $________

Space Data--Classrooms

Sum of all assignable classroom space ________ sq. ft.

Sum of all assigned classrooms ________

Sum of all scheduled weekly classroom hours ________

Sum of all scheduled weekly student classroom hours ________

Sum of all classroom stations ________

Space Data--Labs.

Sum of all assignable lab. space ________ sq. ft.

Sum of all assigned labs. ________

Sum of all scheduled weekly lab hours ________

Sum of all scheduled weekly student lab. hours ________

THESE TWO SHEETS ARE FILLED OUT FOR EACH DEPARTMENT IN THE SCHOOL

Data Sources

Section size and student loads____________________________

Teacher data ____

Space data ____

DATA COLLECTION SHEET RRPM TYPE 3

Institutional Data

Salaries:

Non-teaching salary level 1 (Professional/Management) $____________

Non-teaching salary level 2 (Technical/Craft) $__________

Non-teaching salary level 3 (Clerical/Secretarial) $____________

Non-teaching salary level 4 (Maint./Caretaking) $________

Student Enrolment

Grade 10
Matric. ________
Bus. Ed. _______
General ________
Tech./Voc. ______

Grade 11
Matric. ________
Bus. Ed. _______
General ________
Tech./Voc. _____

Grade 12
Matric. ________
Bus. Ed. _______
General ________
Tech./Voc. _____

Space Data (in sq. ft.)

Total space for:
Classrooms ________
Class/Lab. ________
Office & Conference _________
Library __________
Teacher work rooms _________
Business Machines __________
Rifle and Archery range _________
Phys. Ed. _________
Student Lounge, S.U. and Clubrooms _______
Staff Lounge ________
Marchandizing ________
Dining ________
Student Health ________
Physical Plant ________
Student Counseling ________

Total space for: Library Stack Space ________
Library Reader Space ________
Total Plant ________

APPENDIX C

INPUT DATA LISTING

```
$SIG JGS COPIES=3
ON AT  15:54.14 ON 08-24-72  LAST ON AT  1C:43.19
$C *SOURCE* TO *SINK*
DATA SETS    05   05   05   05   05   C4   03   02   01   06             01
DIMENSIONS   12   01   03   03   04   C1   04                            02
DATE/RUN  05197201                                                        03
YEARS/BASE001972  0.0  0.0                                                04
ISINC     2C00                                                            05
STUD LVLS 123 0000                                                        06
MAJ XOVER 999                                                                      01
DISC-NAME               ENGLISH                                           08       01
DISC-NAME               SOCIAL SCI                                        08       02
DISC-NAME               MATH                                              08       03
DISC-NAME               SCIENCE                                           08       04
DISC-NAME               MODERN LANG.                                      08       05
DISC-NAME               FINE ARTS                                         08       06
DISC-NAME               PHYS.ED.                                          08       07
DISC-NAME               DRIVER ED.                                        08       08
DISC-NAME               BUS.ED.                                           08       09
DISC-NAME               HOUSE EC.                                         08       10
DISC-NAME               TECH / VOC                                        08       11
DISC-NAME               AC.OCC.                                           08       12
COURSE-LEV              GRADE TEN                                         09        1
COURSE-LEV              GRADE ELEVEN                                      09        2
COURSE-LEV              GRADE TWELVE                                      09        3
ICLM          4.2       0.0       0.0                                     01   010101
ICLM          5.5       0.0       0.0                                     01   010102
ICLM          3.4       0.0       0.0                                     01   010103
ICLM          9.8       0.0       0.0                                     01   010104
ICLM          3.2       0.0       0.0                                     01   010105
ICLM          3.0       0.0       0.0                                     01   010106
ICLM          4.3       0.0       0.0                                     01   010107
ICLM          0.6       0.0       0.0                                     01   010108
ICLM          1.3       0.0       0.0                                     01   010109
ICLM          0.9       0.0       0.0                                     01   010110
ICLM          3.2       0.0       0.0                                     01   010111
ICLM          0.0       0.0       0.0                                     01   010112
ICLM          0.8       5.4         0                                     01   010201
ICLM          1.4      11.0       0.5                                     01   010202
ICLM          1.6       3.9       0.0                                     01   010203
ICLM          2.8       9.4       0.1                                     01   010204
ICLM          1.4       4.2       0.0                                     01   010205
ICLM          1.6       2.0       0.0                                     01   010206
ICLM          0.6       2.3       0.0                                     01   010207
ICLM          0.6       0.0       0.0                                     01   010208
ICLM          0.8       1.2       0.1                                     01   010209
ICLM          0.5       0.0       0.0                                     01   010210
ICLM          2.0       0.0       0.0                                     01   010211
ICLM          0.0       0.0       0.0                                     01   010212
ICLM          0.0       0.5       7.8                                     01   010301
ICLM          0.2       1.5       3.0                                     01   010302
ICLM          0.2       1.0       4.8                                     01   010303
ICLM          0.3       1.8       6.6                                     01   010304
ICLM          0.5       0.5       2.6                                     01   010305
ICLM          0.5       0.3       0.8                                     01   010306
ICLM          0.0       0.2       1.0                                     01   010307
ICLM          0.1       0.0       0.0                                     01   010308
ICLM          0.3       0.5       0.3                                     01   010309
ICLM          0.1       0.0       0.0                                     01   010310
ICLM          0.5       0.0       0.0                                     01   010311
```

```
ICLM        0.0      0.0      0.0                                     01  010312
ICLM        4.4      0.0      0.0                                     01  020101
ICLM        8.0      0.0      0.0                                     01  020102
ICLM        3.4      0.0      0.0                                     01  020103
ICLM        9.7      0.0      0.0                                     01  020104
ICLM        3.2      0.0      0.0                                     01  020105
ICLM        3.0      0.0      0.0                                     01  020106
ICLM        4.4      0.0      0.0                                     01  020107
ICLM        0.6      0.0      0.0                                     01  020108
ICLM        1.4      0.0      0.0                                     01  020109
ICLM        2.3      0.0      0.0                                     01  020110
ICLM        3.1      0.0      0.0                                     01  020111
ICLM        0.0      0.0      0.0                                     01  020112
ICLM        0.6      5.4      0.0                                     01  020201
ICLM        1.4      3.8      0.0                                     01  020202
ICLM        1.1      3.9      0.0                                     01  020203
ICLM        1.9      9.4      0.0                                     01  020204
ICLM        1.0      0.0      0.0                                     01  020205
ICLM        1.0      2.0      0.0                                     01  020206
ICLM        0.4      2.4      0.0                                     01  020207
ICLM        0.4      0.0      0.0                                     01  020208
ICLM        0.6      1.2      0.0                                     01  020209
ICLM        0.9      0.0      0.0                                     01  020210
ICLM        1.4      0.2      0.0                                     01  020211
ICLM        0.0      0.0      0.0                                     01  020212
ICLM        0.0      0.8      0.0                                     01  020301
ICLM        0.2      0.8      4.3                                     01  020302
ICLM        0.1      1.5      4.8                                     01  020303
ICLM        0.3      2.7      0.7                                     01  020304
ICLM        0.5      0.0      0.0                                     01  020305
ICLM        0.6      0.5      0.8                                     01  020306
ICLM        0.0      0.3      0.9                                     01  020307
ICLM         .5      0.0      0.0                                     01  020308
ICLM        0.2      0.8      0.5                                     01  020309
ICLM        0.2      0.0      0.0                                     01  020310
ICLM        0.1      0.0      0.0                                     01  020311
ICLM        0.0      0.0      0.0                                     01  020312
ICLM        6.4      0.0      0.0                                     01  030101
ICLM        0.0      0.0      0.0                                     01  030102
ICLM        4.8      0.0      0.0                                     01  030103
ICLM        4.9      0.0      0.0                                     01  030104
ICLM        0.0      0.0      0.0                                     01  030105
ICLM        0.0      0.0      0.0                                     01  030106
ICLM        1.7      0.0      0.0                                     01  030107
ICLM        4.2      0.0      0.0                                     01  030108
ICLM       13.6      0.0      0.0                                     01  030109
ICLM        1.0      0.0      0.0                                     01  030110
ICLM        0.0      0.0      0.0                                     01  030111
ICLM        0.0      0.0      0.0                                     01  030112
ICLM        0.4      8.0      0.0                                     01  030201
ICLM        0.0      3.8      0.0                                     01  030202
ICLM        0.6      2.1      0.0                                     01  030203
ICLM        0.2      0.0      0.0                                     01  030204
ICLM        0.0      0.0      0.0                                     01  030205
ICLM        0.0      0.0      0.0                                     01  030206
ICLM        0.1      2.4      0.0                                     01  030207
ICLM        0.3      0.0      0.0                                     01  030208
ICLM        4.9      6.9      0.0                                     01  030209
ICLM        0.1      0.0      0.0                                     01  030210
ICLM        0.0      0.0      0.0                                     01  030211
```

```
ICLM         0.0       0.0       0.0                                  01   030212
ICLM         0.0       1.1       0.0                                  01   030301
ICLM         0.0       0.8       0.0                                  01   030302
ICLM         0.7       2.4       0.0                                  01   030303
ICLM         0.1       0.0       0.0                                  01   030304
ICLM         0.0       0.0       0.0                                  01   030305
ICLM         0.0       0.0       0.0                                  01   030306
ICLM         0.0       0.3       0.9                                  01   030307
ICLM         0.1       0.0       0.0                                  01   030308
ICLM         0.7       4.0       9.3                                  01   030309
ICLM         0.1       0.0       0.0                                  01   030310
ICLM         0.0       0.0       0.0                                  01   030311
ICLM         0.0       0.0       0.0                                  01   030312
ICLM        11.9       0.0       0.0                                  01   040101
ICLM         0.0       0.0       0.0                                  01   040102
ICLM         7.6       0.0       0.0                                  01   040103
ICLM         5.5       0.0       0.0                                  01   040104
ICLM         0.0       0.0       0.0                                  01   040105
ICLM         0.0       0.0       0.0                                  01   040106
ICLM         4.7       0.0       0.0                                  01   040107
ICLM         0.5       0.0       0.0                                  01   040108
ICLM         0.0       0.0       0.0                                  01   040109
ICLM         0.2       0.0       0.0                                  01   040110
ICLM         2.4       0.1       0.0                                  01   040111
ICLM         0.0       0.0       0.0                                  01   040112
ICLM         1.9       7.7       0.0                                  01   040201
ICLM         0.0       0.0       0.0                                  01   040202
ICLM         2.8       2.0       0.0                                  01   040203
ICLM         1.3       0.0       0.0                                  01   040204
ICLM         0.0       0.0       0.0                                  01   040205
ICLM         0.0       0.0       0.0                                  01   040206
ICLM         0.5       2.3       0.0                                  01   040207
ICLM         0.5       0.0       0.0                                  01   040208
ICLM         0.0       0.0       0.0                                  01   040209
ICLM         0.1       0.0       0.0                                  01   040210
ICLM         1.3      11.7       1.6                                  01   040211
ICLM         0.0       0.0       0.0                                  01   040212
ICLM         0.0       1.1       0.0                                  01   040301
ICLM         0.0       0.0       0.0                                  01   040302
ICLM         0.4       0.8       0.0                                  01   040303
ICLM         0.2       0.0       0.0                                  01   040304
ICLM         0.0       0.0       0.0                                  01   040305
ICLM         0.0       0.0       0.0                                  01   040306
ICLM         0.0       0.4       0.9                                  01   040307
ICLM         0.1       0.0       0.0                                  01   040308
ICLM         0.0       0.0       0.0                                  01   040309
ICLM         0.0       0.0       0.0                                  01   040310
ICLM         0.5       3.9      20.0                                  01   040311
ICLM         0.0       0.0       0.0                                  01   040312
CONT/CRED    .67                                                      02     01 1
CONT/CRED    .67                                                      02     01 2
CONT/CRED    .67                                                      02     01 3
CONT/CRED    .67                                                      02     02 1
CONT/CRED    .67                                                      02     02 2
CONT/CRED    .67                                                      02     02 3
CONT/CRED    .67                                                      02     03 1
CONT/CRED    .67                                                      02     03 2
CONT/CRED    .67                                                      02     03 3
CONT/CRED    .67                                                      02     04 1
CONT/CRED    .67                                                      02     04 2
```

```
CONT/CRED      .67                                                     02     04 3
CONT/CRED      .67                                                     02     05 1
CONT/CRED      .67                                                     02     05 2
CONT/CRED      .67                                                     02     05 3
CONT/CRED      .67                                                     02     06 1
CONT/CRED      .67                                                     02     06 2
CONT/CRED      .67                                                     02     06 3
CONT/CRED      .67                                                     02     07 1
CONT/CRED      .67                                                     02     07 2
CONT/CRED      .67                                                     02     07 3
CONT/CRED      .67                                                     02     08 1
CONT/CRED      .67                                                     02     08 2
CONT/CRED      .67                                                     02     08 3
CONT/CRED      .67                                                     02     09 1
CONT/CRED      .67                                                     02     09 2
CONT/CRED      .67                                                     02     09 3
CONT/CRED      .67                                                     02     10 1
CONT/CRED      .67                                                     02     10 2
CONT/CRED      .67                                                     02     10 3
CONT/CRED      .67                                                     02     11 1
CONT/CRED      .67                                                     02     11 2
CONT/CRED      .67                                                     02     11 3
CONT/CRED      .67                                                     02     12 1
CONT/CRED      .67                                                     02     12 2
CONT/CRED      .67                                                     02     12 3
AVG SEC SZ   26.1                                                      03     01 1
AVG SEC SZ   23.6                                                      03     01 2
AVG SEC SZ   23.7                                                      03     01 3
AVG SEC SZ   30.0                                                      03     02 1
AVG SEC SZ   31.4                                                      03     02 2
AVG SEC SZ   27.1                                                      03     02 3
AVG SEC SZ   23.3                                                      03     03 1
AVG SEC SZ   18.9                                                      03     03 2
AVG SEC SZ   23.5                                                      03     03 3
AVG SEC SZ   28.5                                                      03     04 1
AVG SEC SZ   27.6                                                      03     04 2
AVG SEC SZ   22.6                                                      03     04 3
AVG SEC SZ   26.4                                                      03     05 1
AVG SEC SZ   20.3                                                      03     05 2
AVG SEC SZ   14.5                                                      03     05 3
AVG SEC SZ   25.7                                                      03     06 1
AVG SEC SZ   25.7                                                      03     06 2
AVG SEC SZ   25.7                                                      03     06 3
AVG SEC SZ   25.3                                                      03     07 1
AVG SEC SZ   27.3                                                      03     07 2
AVG SEC SZ   20.3                                                      03     07 3
AVG SEC SZ   26.8                                                      03     08 1
AVG SEC SZ    0.0                                                      03     08 2
AVG SEC SZ    0.0                                                      03     08 3
AVG SEC SZ   27.0                                                      03     09 1
AVG SEC SZ   19.8                                                      03     09 2
AVG SEC SZ   16.0                                                      03     09 3
AVG SEC SZ   17.8                                                      03     10 1
AVG SEC SZ    0.0                                                      03     10 2
AVG SEC SZ    0.0                                                      03     10 3
AVG SEC SZ   14.0                                                      03     11 1
AVG SEC SZ   12.7                                                      03     11 2
AVG SEC SZ   10.0                                                      03     11 3
AVG SEC SZ   15.0                                                      03     12 1
AVG SEC SZ    0.0                                                      03     12 2
```

```
AVG SEC SZ   0.0                                                               03     12 3
FAC DIST     1.0                                                               04   0101 1
FAC DIST    999.                                                               04        1
AVE FAC LD 22.32                                                               05   0101 1
AVE FAC LD 22.32                                                               05   0102 1
AVE FAC LD 22.32                                                               05   0103 1
AVE FAC LD 19.83                                                               05   0201 1
AVE FAC LD 19.83                                                               05   0202 1
AVE FAC LD 19.83                                                               05   0203 1
AVE FAC LD 24.46                                                               05   0301 1
AVE FAC LD 24.46                                                               05   0302 1
AVE FAC LD 24.46                                                               05   0303 1
AVE FAC LD 26.8                                                                05   0401 1
AVE FAC LD 26.8                                                                05   0402 1
AVE FAC LD 26.8                                                                05   0403 1
AVE FAC LD 21.63                                                               05   0501 1
AVE FAC LD 21.63                                                               05   0502 1
AVE FAC LD 21.63                                                               05   0503 1
AVE FAC LD 16.9                                                                05   0601 1
AVE FAC LD 16.9                                                                05   0602 1
AVE FAC LD 16.9                                                                05   0603 1
AVE FAC LD 20.53                                                               05   0701 1
AVE FAC LD 20.53                                                               05   0702 1
AVE FAC LD 20.53                                                               05   0703 1
AVE FAC LD  26.8                                                               05   0801 1
AVE FAC LD  26.8                                                               05   0802 1
AVE FAC LD  26.8                                                               05   0803 1
AVE FAC LD 24.74                                                               05   0901 1
AVE FAC LD 24.74                                                               05   0902 1
AVE FAC LD 24.74                                                               05   0903 1
AVE FAC LD 21.44                                                               05   1001 1
AVE FAC LD 21.44                                                               05   1002 1
AVE FAC LD 21.44                                                               05   1003 1
AVE FAC LD 26.18                                                               05   1101 1
AVE FAC LD 26.18                                                               05   1102 1
AVE FAC LD 26.18                                                               05   1103 1
AVE FAC LD 26.8                                                                05   1201 1
AVE FAC LD 26.8                                                                05   1202 1
AVE FAC LD 26.8                                                                05   1203 1
NON-AC SAL 8200.     7780.     4318.     3721.                                 06        01
NON-AC SAL 8200.     7780.     4318.     3721.                                 06        02
NON-AC SAL 8200.     7780.     4318.     3721.                                 06        03
NON-AC SAL 8200.     7780.     4318.     3721.                                 06        04
NON-AC SAL 8200.     7780.     4318.     3721.                                 06        05
NON-AC SAL 8200.     7780.     4318.     3721.                                 06        06
NON-AC SAL 8200.     7780.     4318.     3721.                                 06        07
NON-AC SAL 8200.     7780.     4318.     3721.                                 06        08
NON-AC SAL 8200.     7780.     4318.     3721.                                 06        09
NON-AC SAL 8200.     7780.     4318.     3721.                                 06        10
NON-AC SAL 8200.     7780.     4318.     3721.                                 06        11
NON-AC SAL 8200.     7780.     4318.     3721.                                 06        12
FAC SAL     9172.                                                              07        01
FAC SAL     9880.                                                              07        02
FAC SAL    12048.                                                              07        03
FAC SAL    10170.                                                              07        04
FAC SAL    10850.                                                              07        05
FAC SAL    11086.                                                              07        06
FAC SAL    10779.                                                              07        07
FAC SAL    10875.                                                              07        08
FAC SAL     9574.                                                              07        09
```

```
FAC SAL    12813.                                                                    07       10
FAC SAL    11364.                                                                    07       11
FAC SAL     9265.                                                                    07       12
GROWTH-SAL  0.06        0.06      0.06        0.06       0.06       0.06             08
LOAD-MAJOR  999.                                                                     09       01
GRADS10      0.0                                                                     40010101
GRADS10      0.0                                                                     40010102
GRADS10      0.0                                                                     40010103
GRADS10      0.0                                                                     40010104
GRADS10      0.0                                                                     40010105
GRADS10      0.0                                                                     40010106
GRADS10      0.0                                                                     40010107
GRADS10      0.0                                                                     40010108
GRADS10      0.0                                                                     40010109
GRADS10      0.0                                                                     40010110
GRADS10      0.0                                                                     40010111
GRADS10      0.0                                                                     40010112
SUPLY10           695.37                                                             40010201
SUPLY10           857.00                                                             40010202
SUPLY10           136.65                                                             40010203
SUPLY10          1216.04                                                             40010204
SUPLY10          1213.91                                                             40010205
SUPLY10          2586.77                                                             40010206
SUPLY10          1245.46                                                             40010207
SUPLY10             0.00                                                             40010208
SUPLY10           764.80                                                             40010209
SUPLY10          1024.52                                                             40010210
SUPLY10          2783.01                                                             40010211
SUPLY10             0.00                                                             40010212
TRAVL10     50.0                                                                     40010301
TRAVL10     50.0                                                                     40010302
TRAVL10     50.0                                                                     40010303
TRAVL10     50.0                                                                     40010304
TRAVL10     50.0                                                                     40010305
TRAVL10    500.0                                                                     40010306
TRAVL10    500.0                                                                     40010307
TRAVL10     50.0                                                                     40010308
TRAVL10     50.0                                                                     40010309
TRAVL10     50.0                                                                     40010310
TRAVL10     50.0                                                                     40010311
TRAVL10     50.0                                                                     40010312
EQUIP10           203.85                                                             40010401
EQUIP10           442.04                                                             40010402
EQUIP10            15.17                                                             40010403
EQUIP10           261.69                                                             40010404
EQUIP10            74.21                                                             40010405
EQUIP10          2114.45                                                             40010406
EQUIP10           127.66                                                             40010407
EQUIP10             0.00                                                             40010408
EQUIP10           731.37                                                             40010409
EQUIP10             0.00                                                             40010410
EQUIP10           184.08                                                             40010411
EQUIP10             0.00                                                             40010412
NONAC10      0.0                                                                     40020101 1
NONAC10      0.0                                                                     40020101 2
NONAC10      0.0                                                                     40020101 3
NONAC10      0.0                                                                     40020101 4
NONAC10      0.0                                                                     40020102 1
NONAC10      0.0                                                                     40020102 2
NONAC10      0.0                                                                     40020102 3
```

```
NONAC10     0.0                                                        40020102 4
NONAC10     0.0                                                        40020103 1
NONAC10     0.0                                                        40020103 2
NONAC10     0.0                                                        40020103 3
NONAC10     0.0                                                        40020103 4
NONAC10     0.0                                                        40020104 1
NONAC10     0.0                                                        40020104 2
NONAC10     0.0                                                        40020104 3
NONAC10     0.0                                                        40020104 4
NONAC10     0.0                                                        40020105 1
NONAC10     0.0                                                        40020105 2
NONAC10     0.0                                                        40020105 3
NONAC10     0.0                                                        40020105 4
NONAC10     0.0                                                        40020106 1
NONAC10     0.0                                                        40020106 2
NONAC10     0.0                                                        40020106 3
NONAC10     0.0                                                        40020106 4
NONAC10     0.0                                                        40020107 1
NONAC10     0.0                                                        40020107 2
NONAC10     0.0                                                        40020107 3
NONAC10     0.0                                                        40020107 4
NONAC10     0.0                                                        40020108 1
NONAC10     0.0                                                        40020108 2
NONAC10     0.0                                                        40020108 3
NONAC10     0.0                                                        40020108 4
NONAC10     0.0                                                        40020109 1
NONAC10     0.0                                                        40020109 2
NONAC10     0.0                                                        40020109 3
NONAC10     0.0                                                        40020109 4
NONAC10     0.0                                                        40020110 1
NONAC10     0.0                                                        40020110 2
NONAC10     0.0                                                        40020110 3
NONAC10     0.0                                                        40020110 4
NONAC10     0.0                                                        40020111 1
NONAC10     0.0                                                        40020111 2
NONAC10     0.0                                                        40020111 3
NONAC10     0.0                                                        40020111 4
NONAC10     0.0                                                        40020112 1
NONAC10     0.0                                                        40020112 2
NONAC10     0.0                                                        40020112 3
NONAC10     0.0                                                        40020112 4
STUD ENROL  199   121   162                                       197119          01
STUD ENROL   68    62    63                                       197119          02
STUD ENROL   19    62    54                                       197119          03
STUD ENROL   90    66    54                                       197119          04
END CHNGS                                                                  9
```

APPENDIX D

OUTPUT OF MODEL WITH ORIGINAL DATA

```
RRPM 1.3       INTERMEDIATE OUTPUT FOR YEAR  1      PAGE NO.   1
RUN NO.  1           BY INSTRUCTION TYPE             5/19/72

     **** STUDENT DATA ****    ********* FACULTY DATA **********
IN   CR.   CT/CR CT.    AVE.  CT.   RANK PER  CT.    LOAD   FTES
TYPE HOURS RATIO HOURS  SECT. HOURS      CENT HOURS


ENGLISH      GRADE TEN        INSTRUCTION

 1         0.670 1749.9  26.1 67.05  1   1.00 67.05  22.32  3.00

                                       -----  -----        -----
                                         1.00 67.05         3.00
    ------ ----- ------       -----                        -----
    2611.8 0.670 1749.9       67.05                         3.00

ENGLISH      GRADE ELEVEN     INSTRUCTION

 1         0.670 1502.5  23.6 63.67  1   1.00 63.67  22.32  2.85

                                       -----  -----        -----
                                         1.00 63.67         2.85
    ------ ----- ------       -----                        -----
    2242.6 0.670 1502.5       63.67                         2.85
```

```
RRPM 1.3       INTERMEDIATE OUTPUT FOR YEAR  1     PAGE NO.   2
RUN NO.  1           BY INSTRUCTICN TYPE            5/19/72

     **** STUDENT DATA ****    ********* FACULTY DATA *********
IN   CR.   CT/CR CT.    AVE.  CT.   RANK PER  CT.    LOAD   FTES
TYPE HOURS RATIO HOURS  SECT. HOURS      CENT HOURS


ENGLISH      GRADE TWELVE     INSTRUCTICN

 1         0.670  846.6  23.7 35.72  1   1.00 35.72  22.32  1.60

                                        ----- -----        -----

                                         1.00 35.72         1.60
    ------ ----- ------       -----                        -----
    1263.6 0.670  846.6       35.72                         1.60
    ------       ------       -----                        -----
    6118.0       4099.1      166.44                         7.46
```

```
RRPM 1.3         INTERMEDIATE OUTPUT FOR YEAR  1       PAGE NO.   3
RUN NO.  1              BY INSTRUCTION TYPE              5/19/72

     **** STUDENT DATA ****    ********* FACULTY DATA *********
IN    CR.   CT/CR CT.     AVE.  CT.    RANK PER  CT.    LOAD   FTES
TYPE HOURS RATIO HOURS   SECT. HOURS       CENT HOURS


SOCIAL SCI   GRADE TEN          INSTRUCTION

 1          0.670 1299.6  30.0 43.32  1    1.00 43.32  19.83  2.18

                                          ----- -----          -----
                                           1.00 43.32           2.18
    ------ ----- ------       -----                            -----
    1939.7 0.670 1299.6       43.32                             2.18

SOCIAL SCI   GRADE ELEVEN       INSTRUCTION

 1          0.670 1433.0  31.4 45.64  1    1.00 45.64  19.83  2.30

                                          ----- -----          -----
                                           1.00 45.64           2.30
    ------ ----- ------       -----                            -----
    2138.8 0.670 1433.0       45.64                             2.30
```

```
RRPM 1.3          INTERMEDIATE OUTPUT FOR YEAR  1       PAGE NO.   4
RUN NO.  1              BY INSTRUCTION TYPE               5/19/72

     **** STUDENT DATA ****    ********* FACULTY DATA *********
IN   CR.   CT/CR CT.     AVE.  CT.    RANK PER  CT.     LOAD   FTES
TYPE HOURS RATIO HOURS   SECT. HOURS       CENT HOURS


SOCIAL SCI   GRADE TWELVE      INSTRUCTION

 1           0.670  547.7  27.1 20.21  1    1.00 20.21  19.83  1.02

                                           ----- -----         -----
                                            1.00 20.21          1.02
     ------ ----- ------       -----                           -----
      817.4 0.670  547.7       20.21                            1.02
     ------       ------       -----                           -----
     4895.9       3280.3      109.17                            5.51
```

```
RRPM 1.3       INTERMEDIATE OUTPUT FOR YEAR  1      PAGE NO.   5
RUN NO.  1           BY INSTRUCTION TYPE             5/19/72

     **** STUDENT DATA ****   ********* FACULTY DATA **********
IN   CR.   CT/CR CT.    AVE.  CT.   RANK PER  CT.    LOAD   FTES
TYPE HOURS RATIO HOURS  SECT. HOURS      CENT HOURS


MATH         GRADE TEN        INSTRUCTION

 1         0.670 1517.5  23.3 65.13  1   1.00 65.13  24.46  2.66

                                        ----- -----        -----
                                         1.00 65.13         2.66
    ------ ----- ------       -----                        -----
    2264.9 0.670 1517.5       65.13                         2.66

MATH         GRADE ELEVEN     INSTRUCTION

 1         0.670  941.5  18.9 49.81  1   1.00 49.81  24.46  2.04

                                        ----- -----        -----
                                         1.00 49.81         2.04
    ------ ----- ------       -----                        -----
    1405.2 0.670  941.5       49.81                         2.04
```

```
RRPM 1.3        INTERMEDIATE OUTPUT FOR YEAR  1       PAGE NO.   6
RUN NO.  1             BY INSTRUCTION TYPE             5/19/72

     **** STUDENT DATA ****    ********* FACULTY DATA *********
IN   CR.    CT/CR CT.     AVE.  CT.    RANK PER  CT.     LOAD    FTES
TYPE HOURS RATIO HOURS   SECT. HOURS       CENT HOURS


MATH          GRADE TWELVE     INSTRUCTION

 1          0.670  723.6  23.5 30.79  1   1.00 30.79  24.46  1.26

                                          ----- -----          -----
                                          1.00 30.79           1.26
    ------ ----- ------       -----                            -----
    1080.0 0.670  723.6       30.79                            1.26
    ------       ------       -----                            -----
    4750.1       3182.6      145.73                            5.96
```

```
RRPM 1.3       INTERMEDIATE OUTPUT FOR YEAR  1      PAGE NO.   7
RUN NO.  1           BY INSTRUCTION TYPE            5/19/72

     **** STUDENT DATA ****    ********* FACULTY DATA **********
IN   CR.   CT/CR CT.    AVE.  CT.   RANK PER  CT.    LOAD   FTES
TYPE HOURS RATIO HOURS  SECT. HOURS      CENT HOURS


SCIENCE      GRADE TEN        INSTRUCTION

 1         0.670 2570.4  28.5 90.19  1   1.00 90.19  26.80  3.37

                                        ----- -----         -----
                                         1.00 90.19          3.37
    ------ ----- ------       -----                          -----
    3836.4 0.670 2570.4       90.19                          3.37

SCIENCE      GRADE ELEVEN     INSTRUCTION

 1         0.670 1461.9  27.6 52.97  1   1.00 52.97  26.80  1.98

                                        ----- -----         -----
                                         1.00 52.97          1.98
    ------ ----- ------       -----                          -----
    2181.9 0.670 1461.9       52.97                          1.98
```

```
RRPM 1.3       INTERMEDIATE OUTPUT FOR YEAR  1      PAGE NO.   8
RUN NO.  1           BY INSTRUCTION TYPE                5/19/72

     **** STUDENT DATA ****    ********* FACULTY DATA **********
IN   CR.  CT/CR CT.    AVE.  CT.   RANK PER  CT.    LOAD   FTES
TYPE HOURS RATIO HOURS SECT. HOURS      CENT HOURS


SCIENCE      GRADE TWELVE     INSTRUCTION

 1         0.670  754.0  22.6 33.36  1   1.00 33.36  26.80  1.24

                                        ----- -----        -----
                                         1.00 33.36         1.24
    ------ ----- ------       -----                        -----
    1125.4 0.670  754.0       33.36                         1.24
    ------      ------       -----                        -----
    7143.7       4786.3      176.52                         6.59
```

```
RRPM 1.3        INTERMEDIATE OUTPUT FOR YEAR  1      PAGE NO.   9
RUN NO.  1            BY INSTRUCTION TYPE             5/19/72

     **** STUDENT DATA ****    ********* FACULTY DATA *********
IN   CR.   CT/CR CT.     AVE.  CT.    RANK PER  CT.    LOAD   FTES
TYPE HOURS RATIO HOURS   SECT. HOURS       CENT HOURS


MODERN LANG. GRADE TEN         INSTRUCTION

 1          0.670  802.9  26.4 30.41  1    1.00 30.41  21.63  1.41

                                          ----- -----         -----
                                           1.00 30.41          1.41
    ------ ----- ------        -----                           -----
    1198.3 0.670  802.9       30.41                            1.41

MODERN LANG. GRADE ELEVEN      INSTRUCTION

 1          0.670  394.8  20.3 19.45  1    1.00 19.45  21.63  0.90

                                          ----- -----         -----
                                           1.00 19.45          0.90
    ------ ----- ------        -----                           -----
     589.2 0.670  394.8       19.45                            0.90
```

```
RRPM 1.3        INTERMEDIATE OUTPUT FOR YEAR  1      PAGE NO.  10
RUN NO.  1            BY INSTRUCTION TYPE              5/19/72

     **** STUDENT DATA ****    ********* FACULTY DATA *********
IN   CR.   CT/CR CT.    AVE.  CT.    RANK PER  CT.    LOAD   FTES
TYPE HOURS RATIO HOURS  SECT. HOURS       CENT HOURS


MODERN LANG. GRADE TWELVE     INSTRUCTION

 1         0.670  282.2  14.5 19.46  1    1.00 19.46  21.63  0.90

                                         ----- -----         -----
                                          1.00 19.46          0.90
     ------ ----- ------      -----                          -----
      421.2 0.670  282.2      19.46                           0.90
     ------       ------      -----                          -----
     2208.7       1479.8      69.32                           3.20
```

```
RRPM 1.3        INTERMEDIATE OUTPUT FOR YEAR  1       PAGE NO.  11
RUN NO.  1            BY INSTRUCTION TYPE               5/19/72

    **** STUDENT DATA ****   ********* FACULTY DATA *********
IN   CR.   CT/CR CT.    AVE.  CT.   RANK PER  CT.    LOAD   FTES
TYPE HOURS RATIO HOURS  SECT. HOURS      CENT HOURS


FINE ARTS    GRADE TEN          INSTRUCTION

 1          0.670  787.5  25.7 30.64  1   1.00 30.64  16.90  1.81

                                          ----- -----        -----
                                          1.00 30.64         1.81
     ------ ----- ------       -----                         -----
     1175.4 0.670  787.5       30.64                         1.81

FINE ARTS    GRADE ELEVEN       INSTRUCTION

 1          0.670  298.9  25.7 11.63  1   1.00 11.63  16.90  0.69

                                          ----- -----        -----
                                          1.00 11.63         0.69
     ------ ----- ------       -----                         -----
      446.1 0.670  298.9       11.63                         0.69
```

```
RRPM 1.3        INTERMEDIATE OUTPUT FOR YEAR  1       PAGE NO.  12
RUN NO.  1             BY INSTRUCTION TYPE             5/19/72

     **** STUDENT DATA ****    ********* FACULTY DATA *********
IN   CR.   CT/CR CT.    AVE.  CT.   RANK PER  CT.    LOAD   FTES
TYPE HOURS RATIO HOURS  SECT. HOURS      CENT HOURS


FINE ARTS    GRADE TWELVE     INSTRUCTION

 1         0.670  120.6  25.7  4.69  1   1.00  4.69  16.90  0.28

                                        ----- -----         -----
                                         1.00  4.69          0.28
     ------ ----- ------       -----                        -----
      180.0 0.670  120.6        4.69                         0.28
     ------       ------       -----                        -----
     1801.5       1207.0       46.97                         2.78
```

```
RRPM 1.3        INTERMEDIATE OUTPUT FOR YEAR  1      PAGE NO.  13
RUN NO.  1            BY INSTRUCTION TYPE             5/19/72

     **** STUDENT DATA ****   ********* FACULTY DATA *********
IN   CR.   CT/CR CT.    AVE.  CT.   RANK PER  CT.    LOAD   FTES
TYPE HOURS RATIO HOURS  SECT. HOURS      CENT HOURS


PHYS.ED.      GRADE TEN         INSTRUCTION

 1           0.670 1170.4  25.3 46.26  1   1.00 46.26  20.53  2.25

                                           ----- -----        -----
                                           1.00 46.26         2.25
       ------ ----- ------      -----                         -----
       1746.8 0.670 1170.4      46.26                         2.25

PHYS.ED.      GRADE ELEVEN      INSTRUCTION

 1           0.670  547.3  27.3 20.05  1   1.00 20.05  20.53  0.98

                                           ----- -----        -----
                                           1.00 20.05         0.98
       ------ ----- ------      -----                         -----
        816.8 0.670  547.3      20.05                         0.98
```

```
RRPM 1.3       INTERMEDIATE OUTPUT FOR YEAR  1      PAGE NO.  14
RUN NO.  1           BY INSTRUCTION TYPE             5/19/72

     **** STUDENT DATA ****    ********* FACULTY DATA *********
IN   CR.  CT/CR CT.    AVE.  CT.   RANK PER  CT.    LOAD   FTES
TYPE HOURS RATIO HOURS  SECT. HOURS      CENT HOURS


PHYS.ED.     GRADE TWELVE     INSTRUCTION

 1         0.670  211.7  20.3 10.43  1   1.00 10.43  20.53  0.51

                                        ----- -----        -----
                                         1.00 10.43         0.51
    ------ ----- ------       -----                        -----
     315.9 0.670  211.7       10.43                         0.51
    ------       ------       -----                        -----
    2879.5       1929.3       76.73                         3.74
```

```
RRPM 1.3       INTERMEDIATE OUTPUT FOR YEAR  1     PAGE NO.  15
RUN NO.  1           BY INSTRUCTION TYPE            5/19/72

     **** STUDENT DATA ****   ********* FACULTY DATA *********
IN   CR.   CT/CR CT.    AVE.  CT.  RANK PER  CT.    LOAD   FTES
TYPE HOURS RATIO HOURS  SECT. HOURS     CENT HOURS


DRIVER ED.   GRADE TEN        INSTRUCTION

 1         0.670  330.0  26.8 12.31  1  1.00 12.31  26.80  0.46

                                       ----- -----        -----
                                        1.00 12.31         0.46
    ------ ----- ------      -----                        -----
     492.5 0.670  330.0       12.31                        0.46

DRIVER ED.   DOES NOT HAVE GRADE ELEVEN    INSTRUCTION


DRIVER ED.   DOES NOT HAVE GRADE TWELVE    INSTRUCTION

    ------       ------      -----                        -----
     492.5        330.0       12.31                        0.46
```

```
RRPM 1.3       INTERMEDIATE OUTPUT FOR YEAR  1      PAGE NO.  16
RUN NO.  1           BY INSTRUCTION TYPE             5/19/72

     **** STUDENT DATA ****   ********* FACULTY DATA *********
IN   CR.   CT/CR CT.    AVE.  CT.   RANK PER  CT.    LOAD   FTES
TYPE HOURS RATIO HOURS  SECT. HOURS      CENT HOURS


BUS.ED.      GRADE TEN        INSTRUCTION

 1         0.670  769.9  27.0 28.51  1   1.00 28.51  24.74  1.15

                                        ----- -----        -----
                                         1.00 28.51         1.15
    ------ ----- ------       -----                        -----
    1149.1 0.670  769.9       28.51                         1.15

BUS.ED.      GRADE ELEVEN     INSTRUCTION

 1         0.670  666.5  19.8 33.66  1   1.00 33.66  24.74  1.36

                                        ----- -----        -----
                                         1.00 33.66         1.36
    ------ ----- ------       -----                        -----
     994.8 0.670  666.5       33.66                         1.36
```

```
RRPM 1.3        INTERMEDIATE OUTPUT FOR YEAR  1      PAGE NO.  17
RUN NO.  1            BY INSTRUCTION TYPE              5/19/72

     **** STUDENT DATA ****    ********* FACULTY DATA *********
IN   CR.   CT/CR CT.     AVE.  CT.    RANK PER  CT.    LOAD   FTES
TYPE HOURS RATIO HOURS   SECT. HOURS       CENT HOURS


BUS.ED.      GRADE TWELVE      INSTRUCTICN

 1          0.670  398.2  16.0 24.89  1   1.00 24.89  24.74  1.01

                                          ----- -----         -----
                                          1.00 24.89          1.01
     ------ ----- ------       -----                          -----
      594.4 0.670  398.2       24.89                          1.01
     ------       ------       -----                          -----
     2738.3       1834.7       87.07                          3.52
```

```
RRPM 1.3       INTERMEDIATE OUTPUT FOR YEAR  1      PAGE NO.  18
RUN NO.  1           BY INSTRUCTION TYPE             5/19/72

     **** STUDENT DATA ****   ********* FACULTY DATA *********
IN   CR.   CT/CR CT.    AVE.  CT.   RANK PER  CT.    LOAD   FTES
TYPE HOURS RATIO HOURS  SECT. HOURS      CENT HOURS


HOUSE EC.    GRADE TEN        INSTRUCTION

 1         0.670  359.0  17.8 20.17  1   1.00 20.17  21.44  0.94

                                        ----- -----        -----
                                         1.00 20.17         0.94
    ------ ----- ------       -----                        -----
     535.8 0.670  359.0       20.17                         0.94

HOUSE EC.    DOES NOT HAVE GRADE ELEVEN     INSTRUCTION


HOUSE EC.    DOES NOT HAVE GRADE TWELVE     INSTRUCTION

    ------       ------       -----                        -----
     535.8        359.0       20.17                         0.94
```

```
RRPM 1.3        INTERMEDIATE OUTPUT FOR YEAR  1      PAGE NO.  19
RUN NO.  1            BY INSTRUCTION TYPE             5/19/72

     **** STUDENT DATA ****    ********* FACULTY DATA *********
IN   CR.   CT/CR CT.     AVE.  CT.    RANK PER  CT.    LOAD   FTES
TYPE HOURS RATIO HOURS   SECT. HOURS       CENT HOURS


TECH / VOC   GRADE TEN         INSTRUCTION

 1           0.670 1067.0   14.0 76.21  1   1.00 76.21  26.18  2.91

                                           ----- -----         -----
                                            1.00 76.21          2.91
    ------ ----- ------       -----                            -----
    1592.5 0.670 1067.0       76.21                             2.91

TECH / VOC   GRADE ELEVEN      INSTRUCTION

 1           0.670  672.8   12.7 52.98  1   1.00 52.98  26.18  2.02

                                           ----- -----         -----
                                            1.00 52.98          2.02
    ------ ----- ------       -----                            -----
    1004.2 0.670  672.8       52.98                             2.02
```

```
RRPM 1.3       INTERMEDIATE OUTPUT FOR YEAR  1      PAGE NO.  20
RUN NO.  1           BY INSTRUCTION TYPE             5/19/72

     **** STUDENT DATA ****    ********* FACULTY DATA *********
IN   CR.   CT/CR CT.    AVE.  CT.   RANK PER  CT.    LOAD   FTES
TYPE HOURS RATIO HOURS  SECT. HOURS      CENT HOURS


TECH / VOC   GRADE TWELVE     INSTRUCTION

 1         0.670  794.4  10.0 79.44  1   1.00 79.44  26.18  3.03

                                        ----- -----         -----
                                         1.00 79.44          3.03
    ------ ----- ------       -----                         -----
    1185.6 0.670  794.4       79.44                          3.03
    ------       ------       -----                         -----
    3782.3       2534.1      208.63                          7.97
```

```
RRPM 1.3        INTERMEDIATE OUTPUT FOR YEAR  1       PAGE NO.  21
RUN NO.  1              BY INSTRUCTION TYPE            5/19/72

     **** STUDENT DATA ****   ********* FACULTY DATA *********
IN   CR.   CT/CR CT.     AVE.  CT.   RANK PER  CT.     LOAD   FTES
TYPE HOURS RATIO HOURS   SECT. HOURS      CENT HOURS


AC.OCC.      DOES NOT HAVE GRADE TEN        INSTRUCTION


AC.OCC.      DOES NOT HAVE GRADE ELEVEN     INSTRUCTION


AC.OCC.      DOES NOT HAVE GRADE TWELVE     INSTRUCTION

    ------        ------       -----                         -----
       0.0           0.0         0.0                           0.0
```

```
RRPM 1.3        INTERMEDIATE OUTPUT FOR YEAR  1       PAGE NO.  22
RUN NO.  1                 BY RANK                     5/19/72

                            FACULTY
                 DISCIPLINE RANK  FTES  SALARIES

                ENGLISH       1    7.46  68393.50

                                  -----  ---------
                                   7.46 $ 68393.50

                SOCIAL SCI    1    5.51  54390.11

                                  -----  ---------
                                   5.51 $ 54390.11

                MATH          1    5.96  71782.31

                                  -----  ---------
                                   5.96 $ 71782.31

                SCIENCE       1    6.59  66985.00

                                  -----  ---------
                                   6.59 $ 66985.00

                MODERN LANG.  1    3.20  34772.27

                                  -----  ---------
                                   3.20 $ 34772.27
```

```
RRPM 1.3         INTERMEDIATE OUTPUT FOR YEAR  1        PAGE NO.  23
RUN NO.  1                     BY RANK                   5/19/72

                        FACULTY
               DISCIPLINE RANK  FTES  SALARIES

              FINE ARTS     1     2.78  30808.02

                                 -----  ---------

                                  2.78 $ 30808.02

              PHYS.ED.      1     3.74  40286.73

                                 -----  ---------

                                  3.74 $ 40286.73

              DRIVER ED.    1     0.46   4996.20

                                 -----  ---------

                                  0.46 $  4996.20

              BUS.ED.       1     3.52  33693.80

                                 -----  ---------

                                  3.52 $ 33693.80

              HOUSE EC.     1     0.94  12052.66

                                 -----  ---------

                                  0.94 $ 12052.66

              TECH / VOC    1     7.97  90558.25

                                 -----  ---------

                                  7.97 $ 90558.25
```

```
RRPM 1.3        INTERMEDIATE OUTPUT FOR YEAR  1        PAGE NO.  24
RUN NO.  1                   BY RANK                    5/19/72

                             FACULTY
                  DISCIPLINE RANK  FTES  SALARIES

                 AC.OCC.       1     0.0        0.0

                                   -----  ---------
                                     0.0  $       0.0
```

```
RRPM 1.3       INTERMEDIATE OUTPUT FOR YEAR  1        PAGE NO.  25
RUN NO.  1             BY DISCIPLINE                   5/19/72

                    NON-ACADEMIC STAFF
                 DISCIPLINE RANK  FTES  SALARIES

                ENGLISH       1     0.0       0.0
                              2     0.0       0.0
                              3     0.0       0.0
                              4     0.0       0.0

                                   -----  ---------
                                    0.0  $     0.0

                SOCIAL SCI    1     0.0       0.0
                              2     0.0       0.0
                              3     0.0       0.0
                              4     0.0       0.0

                                   -----  ---------
                                    0.0  $     0.0

                MATH          1     0.0       0.0
                              2     0.0       0.0
                              3     0.0       0.0
                              4     0.0       0.0

                                   -----  ---------
                                    0.0  $     0.0

                SCIENCE       1     0.0       0.0
                              2     0.0       0.0
                              3     0.0       0.0
                              4     0.0       0.0

                                   -----  ---------
                                    0.0  $     0.0

                MODERN LANG.  1     0.0       0.0
                              2     0.0       0.0
                              3     0.0       0.0
                              4     0.0       0.0

                                   -----  ---------
                                    0.0  $     0.0
```

```
RRPM 1.3          INTERMEDIATE OUTPUT FOR YEAR  1        PAGE NO.  26
RUN NO.  1                BY DISCIPLINE                   5/19/72

                        NON-ACADEMIC STAFF
                  DISCIPLINE RANK   FTES   SALARIES

                  FINE ARTS     1     0.0        0.0
                                2     0.0        0.0
                                3     0.0        0.0
                                4     0.0        0.0

                                    -----   ---------
                                      0.0  $     0.0

                  PHYS.ED.      1     0.0        0.0
                                2     0.0        0.0
                                3     0.0        0.0
                                4     0.0        0.0

                                    -----   ---------
                                      0.0  $     0.0

                  DRIVER ED.    1     0.0        0.0
                                2     0.0        0.0
                                3     0.0        0.0
                                4     0.0        0.0

                                    -----   ---------
                                      0.0  $     0.0

                  BUS.ED.       1     0.0        0.0
                                2     0.0        0.0
                                3     0.0        0.0
                                4     0.0        0.0

                                    -----   ---------
                                      0.0  $     0.0

                  HOUSE EC.     1     0.0        0.0
                                2     0.0        0.0
                                3     0.0        0.0
                                4     0.0        0.0

                                    -----   ---------
                                      0.0  $     0.0

                  TECH / VOC    1     0.0        0.0
                                2     0.0        0.0
                                3     0.0        0.0
                                4     0.0        0.0

                                    -----   ---------
                                      0.0  $     0.0
```

```
RRPM 1.3         INTERMEDIATE OUTPUT FOR YEAR  1        PAGE NO.  27
RUN NO.  1                 BY DISCIPLINE                 5/19/72

                         NON-ACADEMIC STAFF
                   DISCIPLINE RANK  FTES  SALARIES

                  AC.OCC.       1    0.0       0.0
                                2    0.0       0.0
                                3    0.0       0.0
                                4    0.0       0.0
                                   -----  ---------
                                     0.0  $      0.0
```

```
    RRPM 1.3         INTERMEDIATE OUTPUT FOR YEAR  1       PAGE NO.  28
    RUN NO.  1                BY DISCIPLINE                 5/19/72

        DISCIPLINE   SUPPLY       TRAVEL       EQUIPMENT

      ENGLISH       $ 5185.21  $    50.00   $ 1520.06
      SOCIAL SCI    $ 4717.84  $    50.00   $ 2433.46
      MATH          $  814.16  $    50.00   $   90.38
      SCIENCE       $ 8009.48  $    50.00   $ 1723.63
      MODERN LANG.  $ 3890.36  $    50.00   $  237.83
      FINE ARTS     $ 7188.64  $   500.00   $ 5876.06
      PHYS.ED.      $ 4654.93  $   500.00   $  477.13
      DRIVER ED.    $     0.0  $    50.00   $    0.0
      BUS.ED.       $ 2691.56  $    50.00   $ 2573.91
      HOUSE EC.     $  963.72  $    50.00   $    0.0
      TECH / VOC    $22177.45  $    50.00   $ 1466.91
      AC.OCC.       $     0.0  $    50.00   $    0.0
OKAY THRU YSTUDR
OKAY THRU WRSCRT

- END OF YEAR 1 -
COL. 1-10   ADJUSTMENT    NN  KNTRL  FIELD  75-6  77-8 79-80
- FINISHED ENDYR -

 STOP     0
01:03.22 6.234 RC=0
```

APPENDIX E

OUTPUT OF MODEL WITH REVISED FACULTY LOAD DATA

```
RRPM 1.3        INTERMEDIATE OUTPUT FOR YEAR  1      PAGE NO.   1
RUN NO.  1            BY INSTRUCTION TYPE             5/19/72

    **** STUDENT DATA ****   ********* FACULTY DATA *********
IN   CR.    CT/CR CT.     AVE.  CT.    RANK PER  CT.     LOAD   FTES
TYPE HOURS RATIO HOURS   SECT. HOURS       CENT HOURS


ENGLISH       GRADE TEN          INSTRUCTION

 1           0.670 1749.9   26.1 67.05  1    1.00 67.05   23.80   2.82

                                             ----- -----          -----
                                             1.00 67.05           2.82
     ------ ----- ------          -----                           -----
     2611.8 0.670 1749.9          67.05                           2.82

ENGLISH       GRADE ELEVEN       INSTRUCTION

 1           0.670 1502.5   23.6 63.67  1    1.00 63.67   23.80   2.68

                                             ----- -----          -----
                                             1.00 63.67           2.68
     ------ ----- ------          -----                           -----
     2242.6 0.670 1502.5          63.67                           2.68
```

```
RRPM 1.3       INTERMEDIATE OUTPUT FOR YEAR  1      PAGE NO.   2
RUN NO.  1           BY INSTRUCTION TYPE             5/19/72

     **** STUDENT DATA ****   ********* FACULTY DATA **********
IN   CR.   CT/CR CT.    AVE.  CT.   RANK PER  CT.    LOAD   FTES
TYPE HOURS RATIO HOURS  SECT. HOURS      CENT HOURS


ENGLISH      GRADE TWELVE     INSTRUCTION

 1         0.670  846.6  23.7 35.72  1   1.00 35.72  23.80  1.50

                                        ----- -----        -----
                                         1.00 35.72         1.50
    ------ ----- ------       -----                        -----
    1263.6 0.670  846.6       35.72                         1.50
    ------       ------       -----                        -----
    6118.0       4099.1      166.44                         6.99
```

```
RRPM 1.3       INTERMEDIATE OUTPUT FOR YEAR  1      PAGE NO.   3
RUN NO.  1           BY INSTRUCTION TYPE             5/19/72

     **** STUDENT DATA ****   ********* FACULTY DATA *********
IN   CR.   CT/CR CT.    AVE.  CT.    RANK PER  CT.    LOAD   FTES
TYPE HOURS RATIO HOURS  SECT. HOURS       CENT HOURS


SOCIAL SCI   GRADE TEN        INSTRUCTION

 1         0.670 1299.6   30.0 43.32  1   1.00 43.32  23.80  1.82

                                        ----- -----         -----
                                         1.00 43.32          1.82
    ------ ----- ------       -----                         -----
    1939.7 0.670 1299.6       43.32                          1.82

SOCIAL SCI   GRADE ELEVEN     INSTRUCTION

 1         0.670 1433.0   31.4 45.64  1   1.00 45.64  23.80  1.92

                                        ----- -----         -----
                                         1.00 45.64          1.92
    ------ ----- ------       -----                         -----
    2138.8 0.670 1433.0       45.64                          1.92
```

```
RRPM 1.3       INTERMEDIATE OUTPUT FOR YEAR  1      PAGE NO.   4
RUN NO.  1           BY INSTRUCTION TYPE             5/19/72

     **** STUDENT DATA ****    ********* FACULTY DATA *********
IN   CR.   CT/CR CT.    AVE.  CT.   RANK PER  CT.    LOAD   FTES
TYPE HOURS RATIO HOURS  SECT. HOURS      CENT HOURS


SOCIAL SCI   GRADE TWELVE     INSTRUCTION

 1         0.670  547.7  27.1 20.21  1   1.00 20.21  23.80  0.85

                                        ----- -----        -----
                                         1.00 20.21         0.85
    ------ ----- ------       -----                        -----
     817.4 0.670  547.7       20.21                         0.85
    ------       ------       -----                        -----
    4895.9       3280.3      109.17                         4.59
```

```
RRPM 1.3       INTERMEDIATE OUTPUT FOR YEAR  1      PAGE NO.    5
RUN NO.  1           BY INSTRUCTION TYPE             5/19/72

     **** STUDENT DATA ****   ********* FACULTY DATA *********
IN   CR.   CT/CR CT.    AVE.  CT.    RANK PER  CT.     LOAD   FTES
TYPE HOURS RATIO HOURS  SECT. HOURS       CENT HOURS


MATH         GRADE TEN        INSTRUCTION

 1          0.670 1517.5  23.3 65.13  1   1.00 65.13  23.80  2.74

                                         ----- -----         -----
                                          1.00 65.13          2.74
    ------ ----- ------       -----                           -----
    2264.9 0.670 1517.5       65.13                           2.74

MATH         GRADE ELEVEN     INSTRUCTION

 1          0.670  941.5  18.9 49.81  1   1.00 49.81  23.80  2.09

                                         ----- -----         -----
                                          1.00 49.81          2.09
    ------ ----- ------       -----                           -----
    1405.2 0.670  941.5       49.81                           2.09
```

```
RRPM 1.3       INTERMEDIATE OUTPUT FOR YEAR  1        PAGE NO.   6
RUN NO.  1           BY INSTRUCTION TYPE               5/19/72

     **** STUDENT DATA ****   ********* FACULTY DATA **********
IN   CR.   CT/CR CT.    AVE.  CT.    RANK PER  CT.     LOAD   FTES
TYPE HOURS RATIO HOURS  SECT. HOURS       CENT HOURS


MATH         GRADE TWELVE     INSTRUCTION

 1         0.670  723.6  23.5 30.79   1   1.00 30.79   23.80  1.29

                                         ----- -----         -----
                                          1.00 30.79          1.29
    ------ ----- ------       -----                          -----
    1080.0 0.670  723.6       30.79                           1.29
    ------       ------       -----                          -----
    4750.1       3182.6      145.73                           6.12
```

```
RRPM 1.3       INTERMEDIATE OUTPUT FOR YEAR  1      PAGE NO.   7
RUN NO.  1           BY INSTRUCTION TYPE             5/19/72

     **** STUDENT DATA ****   ********* FACULTY DATA **********
IN   CR.   CT/CR CT.    AVE.  CT.   RANK PER  CT.    LOAD   FTES
TYPE HOURS RATIO HOURS  SECT. HOURS      CENT HOURS


SCIENCE      GRADE TEN        INSTRUCTION

 1         0.670 2570.4  28.5 90.19  1   1.00 90.19  23.80  3.79

                                        ----- -----        -----
                                         1.00 90.19         3.79
    ------ ----- ------       -----                        -----
    3836.4 0.670 2570.4       90.19                         3.79

SCIENCE      GRADE ELEVEN     INSTRUCTION

 1         0.670 1461.9  27.6 52.97  1   1.00 52.97  23.80  2.23

                                        ----- -----        -----
                                         1.00 52.97         2.23
    ------ ----- ------       -----                        -----
    2181.9 0.670 1461.9       52.97                         2.23
```

```
RRPM 1.3       INTERMEDIATE OUTPUT FOR YEAR  1      PAGE NO.   8
RUN NO.  1           BY INSTRUCTION TYPE             5/19/72

     **** STUDENT DATA ****   ********* FACULTY DATA *********
IN   CR.   CT/CR CT.    AVE.  CT.    RANK PER  CT.    LOAD   FTES
TYPE HOURS RATIO HOURS  SECT. HOURS       CENT HOURS


SCIENCE      GRADE TWELVE     INSTRUCTION

 1           0.670  754.0  22.6 33.36  1   1.00 33.36  23.80  1.40

                                          ----- -----         -----
                                           1.00 33.36          1.40
    ------ ----- ------       -----                           -----
    1125.4 0.670  754.0       33.36                            1.40
    ------       ------       -----                           -----
    7143.7       4786.3      176.52                            7.42
```

```
RRPM 1.3        INTERMEDIATE OUTPUT FOR YEAR  1      PAGE NO.   9
RUN NO.  1            BY INSTRUCTION TYPE              5/19/72

    **** STUDENT DATA ****    ********* FACULTY DATA *********
/IN  CR.   CT/CR CT.    AVE.  CT.   RANK PER  CT.    LOAD   FTES
TYPE HOURS RATIO HOURS  SECT. HOURS      CENT HOURS


MODERN LANG. GRADE TEN        INSTRUCTION

 1         0.670  802.9  26.4 30.41  1   1.00 30.41  23.80  1.28

                                        ----- -----         -----
                                         1.00 30.41          1.28
   ------ ----- ------        -----                          -----
   1198.3 0.670  802.9        30.41                          1.28

MODERN LANG. GRADE ELEVEN     INSTRUCTION

 1         0.670  394.8  20.3 19.45  1   1.00 19.45  23.80  0.82

                                        ----- -----         -----
                                         1.00 19.45          0.82
   ------ ----- ------        -----                          -----
    589.2 0.670  394.8        19.45                          0.82
```

```
RRPM 1.3         INTERMEDIATE OUTPUT FOR YEAR  1       PAGE NO.  10
RUN NO.  1                BY INSTRUCTION TYPE             5/19/72

     **** STUDENT DATA ****    ********* FACULTY DATA *********
IN   CR.   CT/CR CT.     AVE.  CT.    RANK PER  CT.    LOAD   FTES
TYPE HOURS RATIO HOURS   SECT. HOURS       CENT HOURS


MODERN LANG. GRADE TWELVE      INSTRUCTION

 1         0.670  282.2  14.5 19.46  1   1.00 19.46  23.80  0.82

                                         ----- -----        -----
                                          1.00 19.46        0.82
    ------ ----- ------        -----                        -----
     421.2 0.670  282.2        19.46                        0.82
    ------        ------       -----                        -----
    2208.7        1479.8       69.32                        2.91
```

```
RRPM 1.3       INTERMEDIATE OUTPUT FOR YEAR  1       PAGE NO.  11
RUN NO.  1           BY INSTRUCTION TYPE              5/19/72

     **** STUDENT DATA ****   ********* FACULTY DATA *********
IN   CR.   CT/CR CT.    AVE.  CT.   RANK PER  CT.    LOAD   FTES
TYPE HOURS RATIO HOURS  SECT. HOURS      CENT HOURS


FINE ARTS    GRADE TEN        INSTRUCTION

 1         0.670  787.5  25.7 30.64  1   1.00 30.64  23.80  1.29

                                        ----- -----        -----
                                         1.00 30.64         1.29
    ------ ----- ------       -----                        -----
    1175.4 0.670  787.5       30.64                         1.29

FINE ARTS    GRADE ELEVEN     INSTRUCTION

 1         0.670  298.9  25.7 11.63  1   1.00 11.63  23.80  0.49

                                        ----- -----        -----
                                         1.00 11.63         0.49
    ------ ----- ------       -----                        -----
     446.1 0.670  298.9       11.63                         0.49
```

```
RRPM 1.3       INTERMEDIATE OUTPUT FOR YEAR  1      PAGE NO.  12
RUN NO.  1           BY INSTRUCTION TYPE             5/19/72

     **** STUDENT DATA ****   ********* FACULTY DATA *********
IN   CR.   CT/CR CT.    AVE.  CT.   RANK PER  CT.    LOAD   FTES
TYPE HOURS RATIO HOURS  SECT. HOURS      CENT HOURS


FINE ARTS    GRADE TWELVE     INSTRUCTION

 1         0.670  120.6  25.7  4.69  1   1.00  4.69  23.80  0.20

                                        ----- -----        -----
                                         1.00  4.69         0.20
    ------ ----- ------       -----                        -----
     180.0 0.670  120.6        4.69                         0.20
    ------       ------       -----                        -----
    1801.5       1207.0       46.97                         1.97
```

```
RRPM 1.3       INTERMEDIATE OUTPUT FOR YEAR  1      PAGE NO.  13
RUN NO.  1           BY INSTRUCTION TYPE              5/19/72

     **** STUDENT DATA ****   ********* FACULTY DATA *********
IN   CR.   CT/CR CT.    AVE.  CT.    RANK PER  CT.    LOAD   FTES
TYPE HOURS RATIO HOURS  SECT. HOURS      CENT HOURS


PHYS.ED.     GRADE TEN        INSTRUCTION

 1         0.670 1170.4  25.3 46.26  1   1.00 46.26  23.80  1.94

                                        ----- -----        -----
                                         1.00 46.26         1.94
    ------ ----- ------       -----                        -----
    1746.8 0.670 1170.4       46.26                         1.94

PHYS.ED.     GRADE ELEVEN     INSTRUCTION

 1         0.670  547.3  27.3 20.05  1   1.00 20.05  23.80  0.84

                                        ----- -----        -----
                                         1.00 20.05         0.84
    ------ ----- ------       -----                        -----
     816.8 0.670  547.3       20.05                         0.84
```

```
RRPM 1.3        INTERMEDIATE OUTPUT FOR YEAR  1      PAGE NO.  14
RUN NO.  1            BY INSTRUCTION TYPE             5/19/72

     **** STUDENT DATA ****   ********* FACULTY DATA *********
IN   CR.   CT/CR CT.     AVE.  CT.   RANK PER  CT.     LOAD   FTES
TYPE HOURS RATIO HOURS   SECT. HOURS      CENT HOURS


PHYS.ED.      GRADE TWELVE      INSTRUCTION

 1          0.670  211.7  20.3 10.43  1    1.00 10.43  23.80  0.44

                                            ----- -----         -----
                                             1.00 10.43          0.44
      ------ ----- ------        -----                           -----
       315.9 0.670  211.7       10.43                            0.44
      ------       ------       -----                           -----
      2879.5       1929.3       76.73                            3.22
```

```
RRPM 1.3       INTERMEDIATE OUTPUT FOR YEAR  1      PAGE NO.  15
RUN NO.  1           BY INSTRUCTION TYPE             5/19/72

     **** STUDENT DATA ****    ********* FACULTY DATA *********
IN   CR.   CT/CR CT.    AVE.  CT.    RANK PER  CT.    LOAD   FTES
TYPE HOURS RATIO HOURS  SECT. HOURS       CENT HOURS


DRIVER ED.   GRADE TEN        INSTRUCTION

 1         0.670  330.0  26.8 12.31  1   1.00 12.31  23.80  0.52

                                        ----- -----        -----
                                         1.00 12.31         0.52
    ------ ----- ------       -----                        -----
     492.5 0.670  330.0       12.31                         0.52

DRIVER ED.   DOES NOT HAVE GRADE ELEVEN     INSTRUCTION


DRIVER ED.   DOES NOT HAVE GRADE TWELVE     INSTRUCTION

    ------       ------       -----                        -----
     492.5        330.0       12.31                         0.52
```

```
RRPM 1.3       INTERMEDIATE OUTPUT FOR YEAR  1      PAGE NO.  16
RUN NO.  1           BY INSTRUCTION TYPE            5/19/72

     **** STUDENT DATA ****   ********* FACULTY DATA **********
IN   CR.   CT/CR CT.    AVE.  CT.   RANK PER  CT.    LOAD   FTES
TYPE HOURS RATIO HOURS  SECT. HOURS      CENT HOURS


BUS.ED.      GRADE TEN       INSTRUCTION

 1         0.670  769.9  27.0 28.51  1   1.00 28.51  23.80  1.20

                                       -----  -----       -----
                                         1.00 28.51         1.20
    ------ ----- ------       -----                       -----
    1149.1 0.670  769.9       28.51                         1.20

BUS.ED.      GRADE ELEVEN    INSTRUCTION

 1         0.670  666.5  19.8 33.66  1   1.00 33.66  23.80  1.41

                                       -----  -----       -----
                                         1.00 33.66         1.41
    ------ ----- ------       -----                       -----
     994.8 0.670  666.5       33.66                         1.41
```

```
RRPM 1.3       INTERMEDIATE OUTPUT FOR YEAR  1      PAGE NO.  17
RUN NO.  1           BY INSTRUCTION TYPE             5/19/72

     **** STUDENT DATA ****   ********* FACULTY DATA **********
IN    CR.   CT/CR CT.    AVE.  CT.   RANK PER  CT.    LOAD   FTES
TYPE HOURS RATIO HOURS  SECT. HOURS       CENT HOURS


BUS.ED.      GRADE TWELVE     INSTRUCTION

 1         0.670  398.2  16.0 24.89  1   1.00 24.89  23.80  1.05

                                        ----- -----        -----
                                         1.00 24.89         1.05
    ------ ----- ------       -----                        -----
     594.4 0.670  398.2       24.89                         1.05
    ------       ------       -----                        -----
    2738.3       1834.7       87.07                         3.66
```

```
RRPM 1.3       INTERMEDIATE OUTPUT FOR YEAR  1      PAGE NO.  18
RUN NO.  1           BY INSTRUCTION TYPE             5/19/72

     **** STUDENT DATA ****   ********* FACULTY DATA *********
IN   CR.  CT/CR CT.    AVE.  CT.   RANK PER  CT.    LOAD   FTES
TYPE HOURS RATIO HOURS  SECT. HOURS       CENT HOURS


HOUSE EC.    GRADE TEN         INSTRUCTION

 1         0.670  359.0  17.8 20.17  1   1.00 20.17  23.80  0.85

                                        ----- -----         -----
                                         1.00 20.17          0.85
    ------ ----- ------      -----                           -----
     535.8 0.670  359.0      20.17                           0.85

HOUSE EC.    DOES NOT HAVE GRADE ELEVEN     INSTRUCTION


HOUSE EC.    DOES NOT HAVE GRADE TWELVE     INSTRUCTION

    ------       ------      -----                           -----
     535.8        359.0      20.17                           0.85
```

```
RRPM 1.3       INTERMEDIATE OUTPUT FOR YEAR  1      PAGE NO.  19
RUN NO.  1            BY INSTRUCTION TYPE             5/19/72

     **** STUDENT DATA ****    ********* FACULTY DATA *********
IN   CR.   CT/CR CT.     AVE.  CT.   RANK PER  CT.    LOAD   FTES
TYPE HOURS RATIO HOURS   SECT. HOURS      CENT HOURS


TECH / VOC   GRADE TEN         INSTRUCTION

 1           0.670 1067.0  14.0 76.21  1   1.00 76.21  23.80  3.20

                                           ----- -----        -----
                                           1.00 76.21          3.20
    ------ ----- ------        -----                          -----
    1592.5 0.670 1067.0        76.21                           3.20

TECH / VOC   GRADE ELEVEN      INSTRUCTION

 1           0.670  672.8  12.7 52.98  1   1.00 52.98  23.80  2.23

                                           ----- -----        -----
                                           1.00 52.98          2.23
    ------ ----- ------        -----                          -----
    1004.2 0.670  672.8        52.98                           2.23
```

```
RRPM 1.3       INTERMEDIATE OUTPUT FOR YEAR  1      PAGE NO.  20
RUN NO.  1           BY INSTRUCTION TYPE             5/19/72

     **** STUDENT DATA ****   ********* FACULTY DATA **********
IN   CR.   CT/CR CT.    AVE.  CT.   RANK PER  CT.    LOAD   FTES
TYPE HOURS RATIO HOURS  SECT. HOURS      CENT HOURS


TECH / VOC   GRADE TWELVE     INSTRUCTION

 1         0.670  794.4  10.0 79.44  1   1.00 79.44  23.80  3.34

                                        ----- -----        -----
                                         1.00 79.44         3.34
    ------ ----- ------       -----                        -----
    1185.6 0.670  794.4       79.44                         3.34
    ------       ------       -----                        -----
    3782.3       2534.1      208.63                         8.77
```

```
RRPM 1.3        INTERMEDIATE OUTPUT FOR YEAR  1      PAGE NO.  21
RUN NO.  1            BY INSTRUCTION TYPE             5/19/72

     **** STUDENT DATA ****    ********* FACULTY DATA *********
IN   CR.   CT/CR CT.    AVE.  CT.   RANK PER  CT.    LOAD   FTES
TYPE HOURS RATIO HOURS  SECT. HOURS      CENT HOURS


AC.OCC.      DOES NOT HAVE GRADE TEN         INSTRUCTION


AC.OCC.      DOES NOT HAVE GRADE ELEVEN      INSTRUCTION


AC.OCC.      DOES NOT HAVE GRADE TWELVE      INSTRUCTION

    ------       ------      -----                           -----
       0.0          0.0       0.0                             0.0
```

```
RRPM 1.3        INTERMEDIATE OUTPUT FOR YEAR  1      PAGE NO.  22
RUN NO.  1                BY RANK                     5/19/72

                        FACULTY
             DISCIPLINE RANK   FTES   SALARIES

            ENGLISH       1     6.99   64140.52

                              -----  ---------
                                6.99 $ 64140.52

            SOCIAL SCI    1     4.59   45317.46

                              -----  ---------
                                4.59 $ 45317.46

            MATH          1     6.12   73772.94

                              -----  ---------
                                6.12 $ 73772.94

            SCIENCE       1     7.42   75428.50

                              -----  ---------
                                7.42 $ 75428.50

            MODERN LANG. 1     2.91   31601.86

                              -----  ---------
                                2.91 $ 31601.86
```

```
RRPM 1.3         INTERMEDIATE OUTPUT FOR YEAR  1       PAGE NO.  23
RUN NO.  1                  BY RANK                     5/19/72

                           FACULTY
                 DISCIPLINE RANK   FTES   SALARIES

                FINE ARTS     1     1.97  21876.29

                                   -----  ---------
                                    1.97 $ 21876.29

                PHYS.ED.      1     3.22  34751.55

                                   -----  ---------
                                    3.22 $ 34751.55

                DRIVER ED.    1     0.52   5625.98

                                   -----  ---------
                                    0.52 $  5625.98

                BUS.ED.       1     3.66  35024.57

                                   -----  ---------
                                    3.66 $ 35024.57

                HOUSE EC.     1     0.85  10857.52

                                   -----  ---------
                                    0.85 $ 10857.52

                TECH / VOC    1     8.77  99614.06

                                   -----  ---------
                                    8.77 $ 99614.06
```

```
RRPM 1.3       INTERMEDIATE OUTPUT FOR YEAR  1      PAGE NO.  24
RUN NO.  1                BY RANK                    5/19/72

                          FACULTY
               DISCIPLINE RANK  FTES  SALARIES

              AC.OCC.      1    0.0        0.0

                               -----  ---------
                                0.0  $      0.0
```

```
RRPM 1.3          INTERMEDIATE OUTPUT FOR YEAR  1         PAGE NO.  25
RUN NO.  1                 BY DISCIPLINE                   5/19/72

                      NON-ACADEMIC STAFF
                  DISCIPLINE RANK  FTES  SALARIES

                 ENGLISH      1     0.0        0.0
                              2     0.0        0.0
                              3     0.0        0.0
                              4     0.0        0.0

                                   -----  ---------
                                    0.0  $      0.0

                 SOCIAL SCI   1     0.0        0.0
                              2     0.0        0.0
                              3     0.0        0.0
                              4     0.0        0.0

                                   -----  ---------
                                    0.0  $      0.0

                 MATH         1     0.0        0.0
                              2     0.0        0.0
                              3     0.0        0.0
                              4     0.0        0.0

                                   -----  ---------
                                    0.0  $      0.0

                 SCIENCE      1     0.0        0.0
                              2     0.0        0.0
                              3     0.0        0.0
                              4     0.0        0.0

                                   -----  ---------
                                    0.0  $      0.0

                 MODERN LANG. 1     0.0        0.0
                              2     0.0        0.0
                              3     0.0        0.0
                              4     0.0        0.0

                                   -----  ---------
                                    0.0  $      0.0
```

```
RRPM 1.3          INTERMEDIATE OUTPUT FOR YEAR  1        PAGE NO.  26
RUN NO.  I               BY DISCIPLINE                    5/19/72

                       NON-ACADEMIC STAFF
                   DISCIPLINE RANK  FTES  SALARIES

                  FINE ARTS     1    0.0        0.0
                                2    0.0        0.0
                                3    0.0        0.0
                                4    0.0        0.0

                                    -----  ---------
                                     0.0  $      0.0

                  PHYS.ED.      1    0.0        0.0
                                2    0.0        0.0
                                3    0.0        0.0
                                4    0.0        0.0

                                    -----  ---------
                                     0.0  $      0.0

                  DRIVER ED.    1    0.0        0.0
                                2    0.0        0.0
                                3    0.0        0.0
                                4    0.0        0.0

                                    -----  ---------
                                     0.0  $      0.0

                  BUS.ED.       1    0.0        0.0
                                2    0.0        0.0
                                3    0.0        0.0
                                4    0.0        0.0

                                    -----  ---------
                                     0.0  $      0.0

                  HOUSE EC.     1    0.0        0.0
                                2    0.0        0.0
                                3    0.0        0.0
                                4    0.0        0.0

                                    -----  ---------
                                     0.0  $      0.0

                  TECH / VOC    1    0.0        0.0
                                2    0.0        0.0
                                3    0.0        0.0
                                4    0.0        0.0

                                    -----  ---------
                                     0.0  $      0.0
```

```
RRPM 1.3          INTERMEDIATE OUTPUT FOR YEAR  1        PAGE NO.  27
RUN NO.  1                BY DISCIPLINE                   5/19/72

                        NON-ACADEMIC STAFF
                   DISCIPLINE RANK  FTES  SALARIES

                  AC.OCC.        1     0.0        0.0
                                 2     0.0        0.0
                                 3     0.0        0.0
                                 4     0.0        0.0

                                      -----   ---------
                                       0.0  $       0.0
```

```
   RRPM 1.3        INTERMEDIATE OUTPUT FOR YEAR  1      PAGE NO.  28
   RUN NO.  1                BY DISCIPLINE                5/19/72

        DISCIPLINE   SUPPLY       TRAVEL      EQUIPMENT

     ENGLISH       $ 4862.77  $    50.00   $ 1425.54
     SOCIAL SCI    $ 3930.88  $    50.00   $ 2027.54
     MATH          $  836.74  $    50.00   $   92.89
     SCIENCE       $ 9019.08  $    50.00   $ 1940.89
     MODERN LANG.  $ 3535.65  $    50.00   $  216.15
     FINE ARTS     $ 5104.54  $   500.00   $ 4172.50
     PHYS.ED.      $ 4015.37  $   500.00   $  411.58
     DRIVER ED.    $     0.0  $    50.00   $     0.0
     BUS.ED.       $ 2797.87  $    50.00   $ 2675.57
     HOUSE EC.     $  868.16  $    50.00   $     0.0
     TECH / VOC    $24395.20  $    50.00   $ 1613.60
     AC.OCC.       $     0.0  $    50.00   $     0.0
OKAY THRU YSTUDR
OKAY THRU WRSCRT

- END OF YEAR 1 -
COL. 1-10   ADJUSTMENT    NN   KNTRL   FIELD   75-6   77-8 79-80
- FINISHED ENDYR -

 STOP      0
01:02.12 6.148 RC=0
```

APPENDIX F

INTERIM REPORT ON ENROLMENTS--GRANDE PRAIRIE COMPOSITE HIGH SCHOOL

INTERIM REPORT ON ENROLMENTS
GRANDE PRAIRIE COMPOSITE HIGH SCHOOL
WINTER SESSION 71-72

Methodology

A sample of 251 students was drawn from the guidance files of the school. Each student selected was classified by grade level and by the type of program that he or she seemed to best fit. This classification by program involved judgement decisions and therefore introduced error into this report. The program classifications were: Matric., General, Bus. Ed., and Tech/Voc.

It was the intent of this sampling to facilitate the ultimate enrolment figures for the school according to the grade level and the program classification of each student. Sampling error did occur and Tables 4 and 5 show the extent of this sampling error.

Results

Table 1 shows the results of the sampling with the raw scores and the resulting percentages of these scores on the total sample (percentages by total).

Table 2 shows the percentages of the scores by rows. Here it is possible to see the composition of each grade level population by the program in which the students are enroled.

Table 3 shows the percentages of the scores by column. Here it is possible to see the composition of each program by grade level.

Table 4 shows the results of the application of the percentages by total to the total school population for the year. Here the only actual figure used was the total population figure of 1010. It may be noted that the resultant sub-totals by grade level do differ from the actual figures for Grades XI and XII. This is due to the sampling error introduced in the actual sampling.

An attempt at adjusting this sampling error was tried and the results are seen in Table 5. Note that while there were minor shifts in the Grade X program enrolments there were more noticeable shifts in the enrolments for the Grades XI and XII students. However, the statistical significance of such shifts could only be determined after further tests had been carried out.

For the purpose of this report it is felt that Table 5 more accurately reflects the reality of the school enrolment by grade level and by programs.

TABLE 1

RAW SCORES AND PERCENTAGES BY TOTAL

Grade of Student	Matric.	General	Bus. Ed.	Tech/Voc.	Total
Grade X	n=50 20%	n=17 7%	n=5 2%	n=22 9%	n=94 38%
Grade XI	n=34 14%	n=17 7%	n=17 7%	n=19 8%	n=87 36%
Grade XII	n=35 14%	n=11 4%	n=12 5%	n=12 5%	n=70 28%
Total	n=119 47%	n=45 18%	n=34 14%	n=53 22%	n=251 100%

TABLE 2

PERCENTAGES BY ROW

Grade of Student	Matric.	General	Bus. Ed.	Tech/Voc.	Total
Grade X	53%	18%	5%	24%	100%
Grade XI	39%	20%	21%	21%	100%
Grade XII	50%	16%	17%	17%	100%

TABLE 3

PERCENTAGES BY COLUMNS

Grade of Student	Matric.	General	Bus. Ed.	Tech/Voc.
Grade X	42%	38%	15%	42%
Grade XI	29%	38%	50%	36%
Grade XII	29%	24%	35%	22%
Total	100%	100%	100%	100%

TABLE 4

PROJECTED ENROLMENTS FROM TOTAL ENROLMENT

(n=1010)

Grade of Student	Matric.	General	Bus. Ed.	Tech/Voc.	Total
Grade X	198	69	20	89	376
Grade XI	139	69	69	79	356
Grade XII	139	40	50	50	279
Total	476	178	139	218	1011*

*From School Records but includes Mathematical Rounding Error.

TABLE 5

PROJECTED ENROLMENTS FROM GRADE SPECIFIC FIGURES

Grade of Student	Matric.	General	Bus. Ed.	Tech/Voc.	Total
Grade X	199	68	19	90	376*
Grade XI	121	62	62	66	311*
Grade XII	162	53	54	54	323*
Total	482	183	135	210	1010*

*From School Records.

B30069